FRIDEN ADDING MACHINE ADJUSTMENTS

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Clutch releasing to early can cause wrong symbols or all 9's to be printed

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FRIDEN ADDING MACHINE ADJUSTMENTS

Insert this section behind the ADDING MACHINE tab of your Friden Calculator and Adding Machine Adjustment Manual.

PREFACE

This section covers adjustments for the Models AB/ABY, AC/ACY, AF/AFY Adding Machines. These adjustments also apply to the adding machine portion of the Add-Punch, and to Electrical Input and Output Models.

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ADJ. 1 ACTUATOR ALIGNMENT

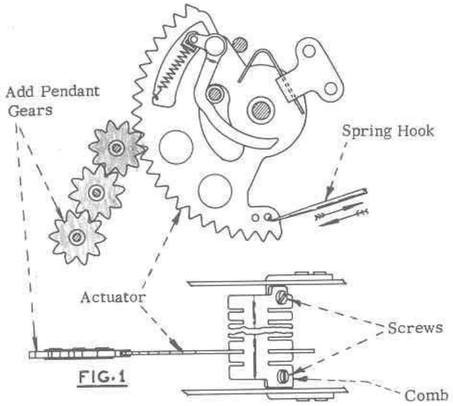


FIG. 1

FIG. 1 ACTUATOR - ADD PENDANT ALIGNMENT

Loosen screws and move the actuator comb right or left to approximately center the actuators with the add pendant gears. Actuators must have 100% engagement with the add pendant gears thru full stroke.

To test individual actuators for freedom of movement: Select all "9"s, depress add key and rotate the drive shaft until actuators are almost at the bottom of their stroke. With a spring hook push and pull the actuator thru its full stroke.

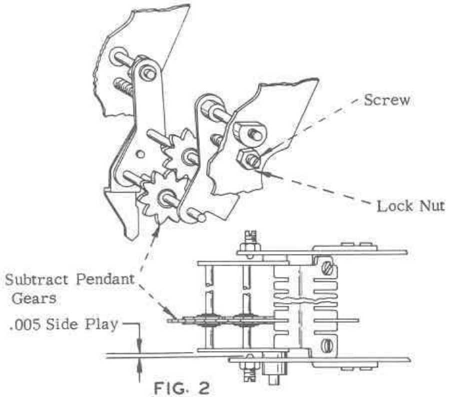


FIG. 2

FIG. 2 ACTUATOR - SUBTRACT PENDANT ALIGNMENT

Loosen lock nuts and turn adjusting screws in or out to approximately center the subtract pendant gears with the actuators. Actuators must have 100% engagement with the subtract pendant gears thru the full stroke. Movement of subtract pendant must not be restricted by the adjusting screws, leave a maximum of .005" side play.

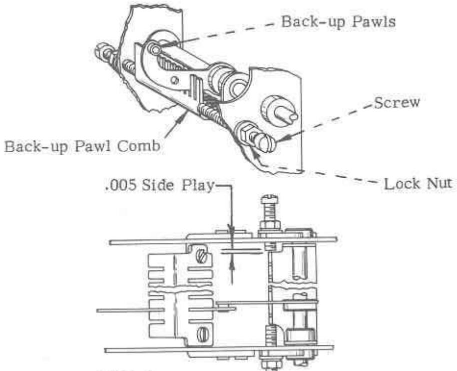
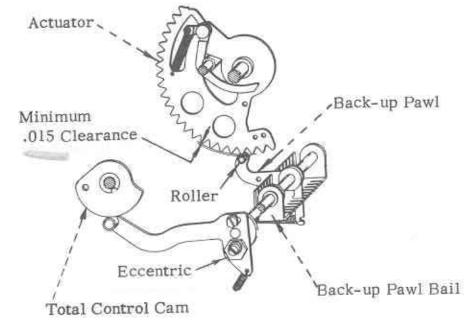


FIG. 3

FIG. 3 ACTUATOR - BACK UP PAWL ALIGNMENT

Loosen lock nuts and turn the adjusting screws in or out to approximately center the back up pawl rollers with the actuators. Movement of the back up pawls must not be restricted by the adjusting screws. Leave a maximum of .005" side play.

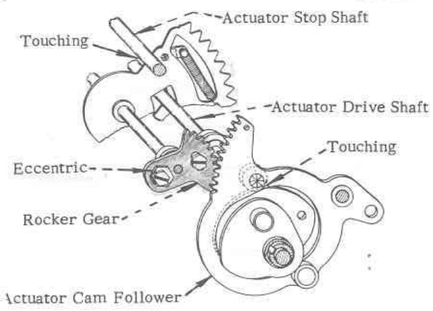
ADJ. 2 ACTUATOR BACK-UP PAWLS



Remove the middle drive idler gear. Select all "9"s, depress the add key and rotate the drive shaft until the teeth of the actuator are opposite the back up pawl rollers. Loosen screws and rotate eccentric to obtain .015" clearance between the rollers and the closest actuator tooth. On older machines without eccentric, loosen screws, hold the roller against the cam and rock the bail with a screwdriver to increase or decrease clearance.

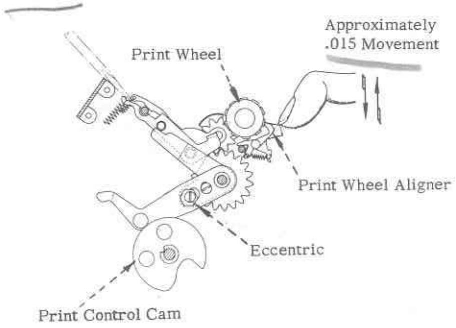
ADJ. 3 ACTUATOR STOP

Roller in Act. Cam Follower
will break loose if too tight



With the drive shaft in home position, loosen screws and turn the eccentric to bring all the actuators into contact with the actuator stop shaft. Test each actuator by pushing it against the stop with a screwdriver. CAUTION: Do not force the eccentric as this will, thru the gear segment and the cam follower, force the roller on the cam follower against the cam causing the stud to become loose.

ADJ. 4 PRINT CONTROL BELLCRANK

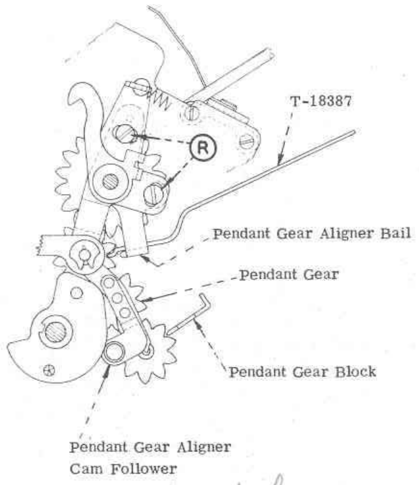


With the machine in home position, place finger as shown and move each print lever up and down. There should be approximately .015" movement. Adjust by loosening screws and rotating the eccentric. If only one or two print arms lack sufficient movement, adjust by inserting a screwdriver as shown and prying up slightly. CAUTION: These parts are hardened and will break easily.

ADJ. 5 PENDANT GEAR ALIGNER BAIL ✓

L.U.

.010 while reading
out



1. Restrict add pendant gear

The pendant gear aligner bail is to be just short of bottoming in the pendant gear valleys at the time in the cycle when the pendant gear aligner cam follower is in the low dwell of its cam and its upper end is resting on its stop.

The points on the pendant gears are to pass the pendant gear aligner bail with clearance to allow free rotation during the actuator stroke.

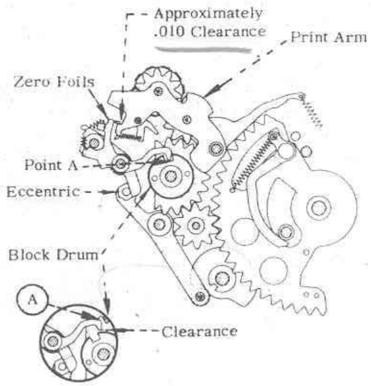
To check, put 9's in the accum and cycle the drive shaft in a sub-total operation observing the clearance during the actuator stroke and the engagement when the pendant gear aligner bail drops into the low dwell.

A good method of adjusting is to have the unit in home position, depress the plus key and cycle the drive shaft until the add pendant has moved forward into engagement with the pendant gear block. Stop cycling the drive shaft just before the pendant aligner moves up to lock the add pendant into engagement.

In this position the pendant gear aligner bail is at its closest point to the pendant gears.

Insert gauge (T18387), as shown, into the valley of the gears. Loosen screws R and move the pendant gear aligner bail in or out. Until the two protruding gauge points will fit freely into the two gauge holes in the pendant gear aligner bail. Tighten screws R.

ADJ. 6 ZERO FOILS ✓



With no selection, release clutch and operate machine by hand until first two numeral print wheels are released to print. There should be approximately .010" clearance between the lip of the zero foil and the print arm as shown. Adjust at the eccentric. With a selection in all orders, release clutch and operate machine by hand. The zero foils should not flicker at the beginning of the actuator downward stroke and all numeral print wheels should rotate. Zero foils should be formed as far to the left as possible, to insure full engagement with block drums.

Reason: To insure the proper engagement of point A with the block drum, since point A cannot be seen the engagement of the lip and the print lever serves as a visable check. If point A does not pull

Continued on next page

ADJ. 6 ZERO FOILS (Cont.)

out of the drum the downward stroke of the actuator will be blocked in that order. If point A is not pulling out far enough, as indicated by a flicker at the beginning of the actuator stroke, the drum may become worn at the edge of the notch, which would allow the zero foil to block the print lever on a "1" selection.

ADJ. 7 CLEAR SIGNAL

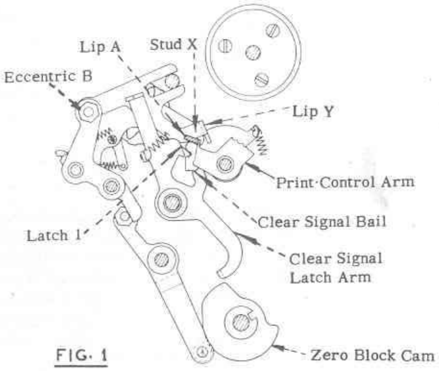


FIG. 1

FIG. 1 CLEAR SIGNAL LATCHING

With machine in home position, depress total key. Latch 1 of the clear signal latch arm should release the clear signal bail allowing it to rest against lip A of the print control arm. There should be a few thousandths clearance between stud X and lip Y, to insure that latch 1 cannot re-latch on the bail when the total key restores at the end of the total cycle. Adjust at eccentric B. The high of the eccentric should be down on "AC" type machines and up on "AB" type.

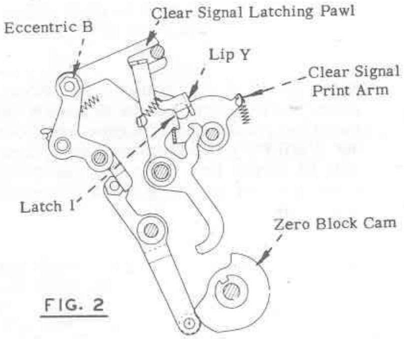


FIG. 2

FIG. 2 CLEAR SIGNAL PRINTING

Depress add key and rotate drive shaft until printing takes place. See that clear signal is printed. Continue to cycle machine until the cam follower is on the high point of the zero block cam. Lip Y of the clear signal latching pawl must rock clear signal print arm far enough that latch 1 can engage the bail of the clear signal print arm. Adjust at eccentric B to obtain proper latching.

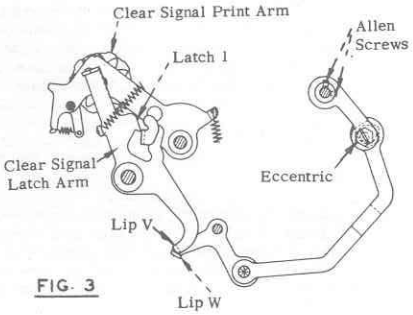


FIG. 3

FIG. 3 DISABLING OF CLEAR SIGNAL (CLEAR KEYBOARD)

Depress total key and cycle machine. Depress clear keyboard key, lip W should contact lip V and rock the clear signal latch arm so latch 1 cannot engage the bail of the clear signal print arm. Adjust at the eccentric, or by loosening the allen screws. Check by depressing the clear keyboard key sharply and operating the machine under power several times.

ADJ. 8 PAPER GUIDE

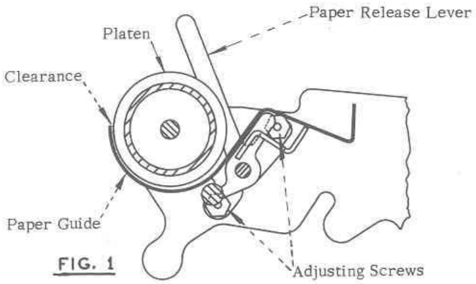


FIG. 1

FIG. 1 PAPER GUIDE (latest style)

Paper should be free, but not loose, between the guide and the platen when the paper release lever is pulled forward. Loosen the screws in the brackets on each side of the paper guide to adjust.

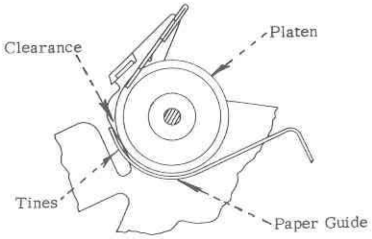


FIG. 2

FIG. 2 PAPER GUIDE (older style)

Adjust by forming tines before installing, then form away from platen to obtain the required clearance after installing.

ADJ. 9 PAPER FEED

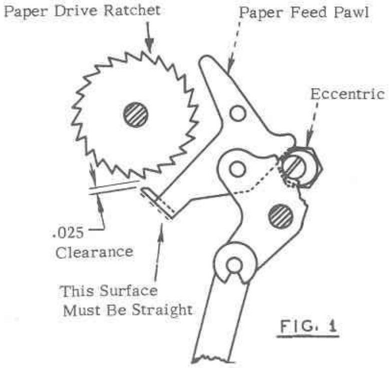


FIG. 1

FIG. 1 PAPER FEED PAWL (AC - AF type)

With machine in home position there should be approximately .025" clearance between the feed pawl and the tips of the paper drive ratchet teeth. Adjust at eccentric, keeping high lobe toward rear of machine. The front surface of the feed pawl must be straight. Check lip of feed pawl with a straight edge and adjust by forming or replace part.

Reason: To allow platen to be turned by hand and to insure feeding correct number of spaces.

ADJ. 9 PAPER FEED

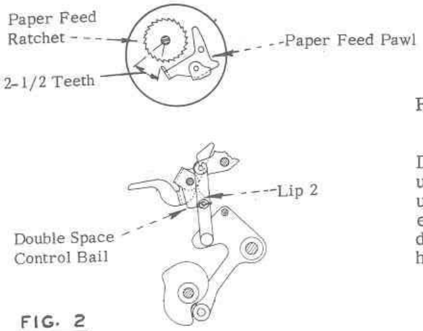


FIG. 2

FIG. 2 DOUBLE SPACE STOP (AC - AF type)

Depress total key and cycle machine until the paper feed pawl has backed up 2 1/2 teeth (see inset). Rotate the eccentric to just touch Lip 2 of the double space control bail. Older style has a fixed stud and is not adjustable.

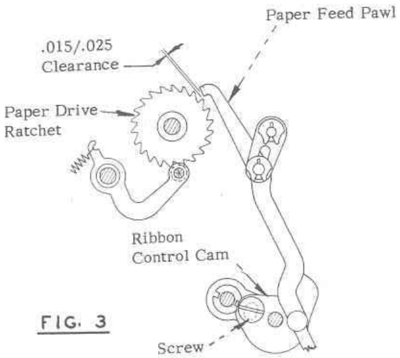


FIG. 3

FIG. 3 PAPER FEED PAWL ("AB" type)

With machine in home position there should be .015" to .025" clearance between the feed pawl and the tips of the paper drive ratchet teeth. Loosen screw and rotate the ribbon control cam to adjust.

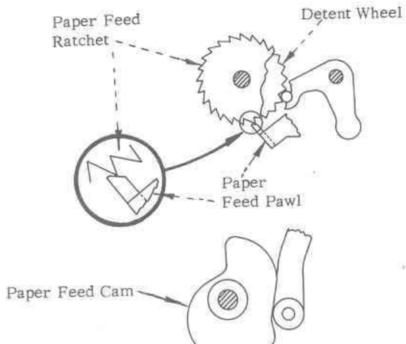


FIG. 4

FIG. 4 PLATEN DETENT (AC - AF type)

With the paper feed cam in the position shown, loosen the set screws in the detent wheel. Rotate the platen until a point of a tooth on the paper drive ratchet is approximately centered on the feed pawl as shown in the inset. Reduce end play in platen shaft and tighten set screws. Test by printing number on tape, back up detent wheel one-half tooth, so roller is on top of tooth, print another number, the second number should print below the first.

Reason: To insure feeding tape correct number of spaces.

ADJ. 9 PAPER FEED

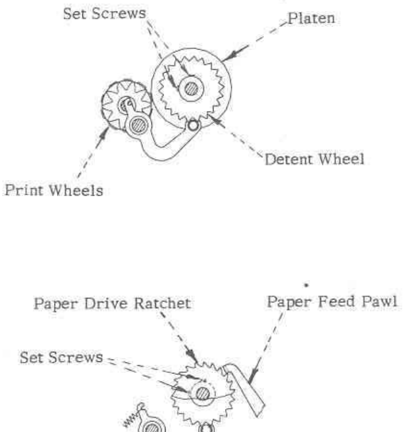


FIG. 5

FIG. 5 PLATEN DETENT ("AB" type)

With print wheels against the platen, loosen the set screws in the detent wheel and position the platen so the figures on the print wheel are squarely against a flat surface of the platen. Tighten set screws in detent wheel. Loosen the set screws in the paper drive ratchet. Cycle machine by hand to the point, near the end of the cycle, where the lip of the paper feed pawl begins to pull away from a ratchet tooth. Insert an allen wrench into one of the set screws and rotate the ratchet to hold the tooth against the lip of the paper drive pawl. Reduce end play in platen shaft to a minimum and tighten set screws. Check manually and under power to see that the detent roller is fully seated in the detent wheel at the end of each cycle and the figures are squarely against a flat surface of the platen during printing.

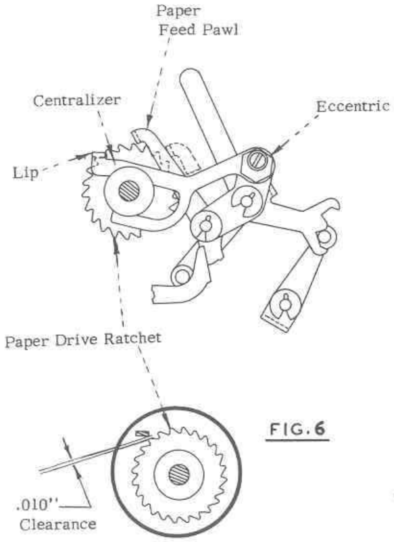
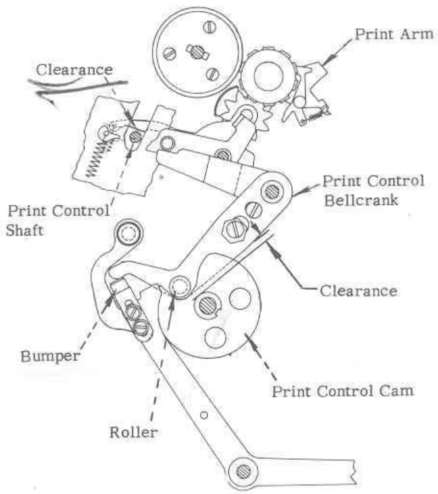


FIG. 6

FIG. 6 PLATEN CENTRALIZER ("AB" type)

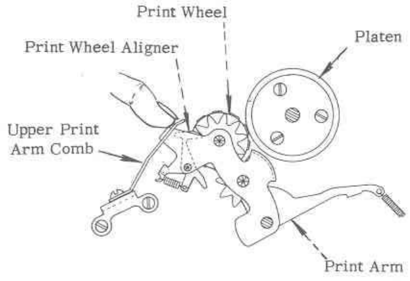
With the machine set for double space, cycle manually until the print wheels are against the platen. At this point lip of centralizer should be just touching a ratchet tooth without pressure. Adjust at the eccentric, keep lobe down. As the lip of the centralizer moves in it should clear the point of a ratchet tooth by approximately .010", (see insert) form lip to adjust, this clearance decreases as the lip moves into the tooth. Test by printing a line, backing the platen up one-half space, roller on top of a tooth, and printing another line. The second line should print, properly spaced below the first.

ADJ. 10 PRINT CONTROL BELLCRANK BUMPER



Release the clutch and cycle the machine until the roller on the print control bellcrank drops into the notch in the print control cam. Adjust the bumper to prevent the print control shaft from bottoming in the slot in the frame on machines having a short slot. On machines having a long slot in the frame, adjust bumper to prevent the print control bellcrank from hitting the sleeve of the print control cam. CAUTION: Do not remove clearance between the print control shaft and the print arms when the print wheels are against the platen.

ADJ. 11 UPPER PRINT ARM COMB



With print wheels against platen, move comb right or left to approximately center print arms in slots. Placing a finger on a print arm as shown, pull it all the way down and let it up slowly. Check each print arm in the same manner. There should be no sticking or binding. Form the upper end of the comb down far enough to prevent the print wheel aligners being disengaged from the print wheels but not so far that the aligners touch the comb at any point.

ADJ. 12 SELECTION

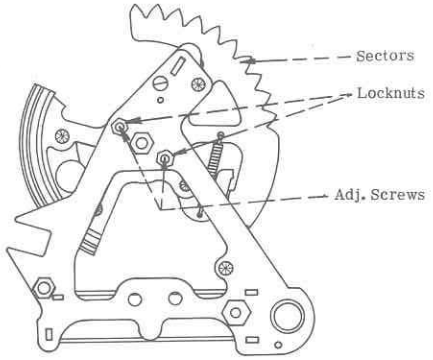


FIG. 1A SECTOR SIDE PLAY

Loosen Lock nuts and turn adjusting screws for minimum side play of sectors. After adjusting, check for free rotation of sectors.

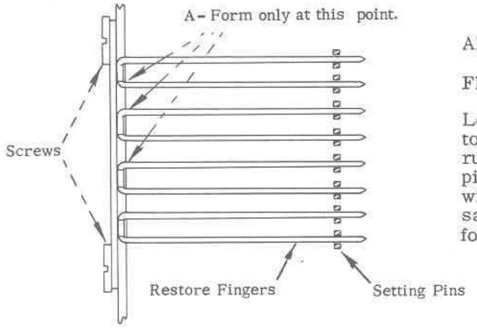


FIG. 1

ADJUSTMENT 12 SELECTION

FIG. 1B RESTORE FINGERS

Loosen screws slightly and move bracket to a position where there is little or no rubbing against the setting pins or the pin board bottom plate for the full width of the carriage. It may be necessary to adjust individual fingers by forming at A.

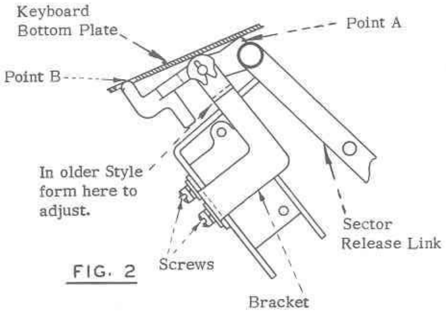


FIG. 2

FIG. 2 RELEASE LINK LIMIT

With point A limited against the bottom plate, point B should not be below the bottom plate or more than 1/32" above the top surface. To adjust, ~~move bracket~~. In older machines without adjustable bracket, adjust by forming form in bracket.

ADJ. 12 SELECTION

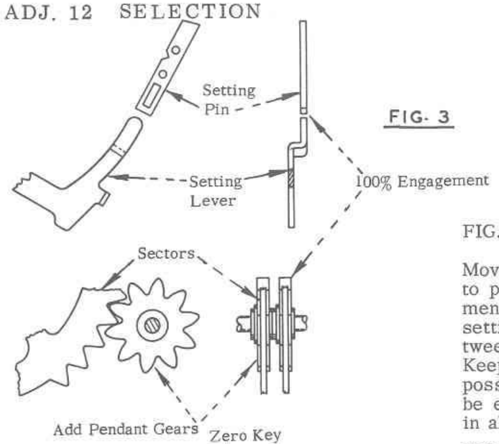


FIG. 3

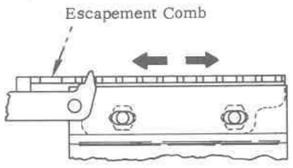


FIG. 3 CARRIAGE ALIGNMENT

Move the escapement comb right or left to provide approximately 100% engagement between the setting pins and the setting levers, and full engagement between the sectors and the pendant gears. Keep the comb pushed down as far as possible when adjusting or difficulty may be experienced with escapement. Check in all carriage positions.

FIG. 4 ZERO KEY

With set screws loose enough to allow slippage, insert 1/16" allen wrench as shown and hold zero key fully depressed. Press rocker arm as far down as possible, tighten screws.

Reason: To allow sufficient overstroke to insure an escapement when zero key is depressed.

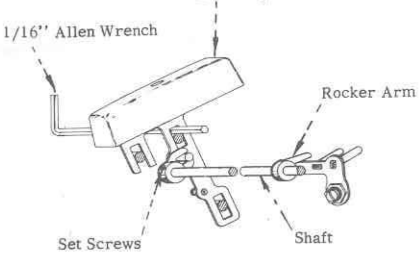


FIG. 4

FIG. 5 ESCAPEMENT PAWL STOP

Slowly depress the zero key. As point A of the escapement pawl clears a tooth of the comb the holding pawl must contact stop B. Form stop B to adjust. Stop B should not be so low that the holding pawl can get under a comb tooth. Check in all carriage positions.

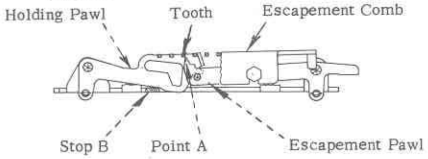


FIG. 5

FIG. 6 ESCAPEMENT PAWL STOP (older style)

Escape carriage to first position and push it back until point A of the escapement pawl is under a tooth of the comb. Adjust screw C, or form ear, to provide a clearance of .015" to .020" to the tail of the escapement pawl. With carriage at extreme right and ear D depressing stud E there should be no pressure against screw C, form ear D.

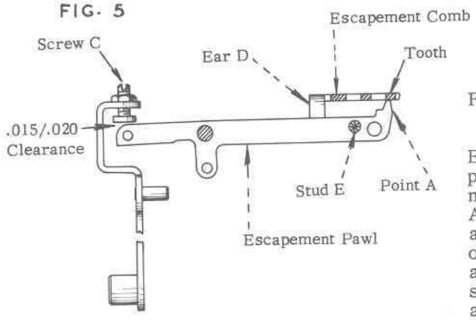


FIG. 6

ADJ. 12 SELECTION

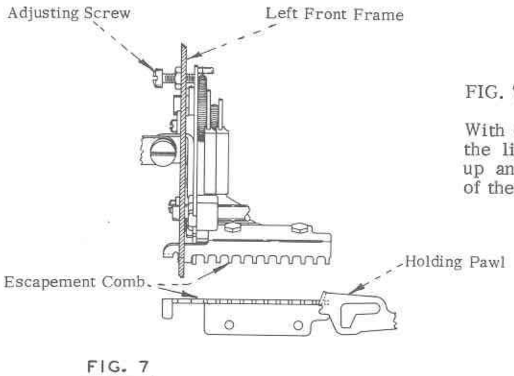


FIG. 7

FIG. 7 LEFT CARRIAGE STOP

With carriage escaped to last position, the lip of the holding pawl should move up and down without touching the teeth of the comb. Adjust stop screw.

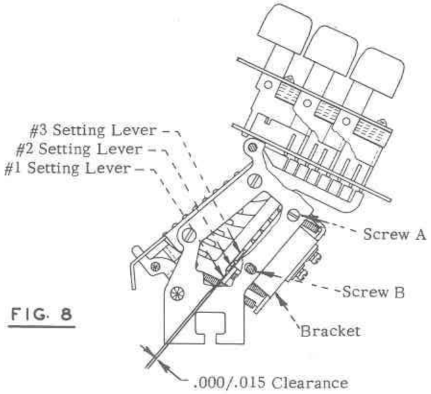


FIG. 8

ACY

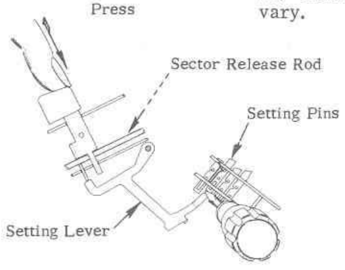
FIG. 8 REMOVAL OF KEYSTEM MOTION

Loosen screws A and B, move the bracket to obtain a clearance .000 to .015 between the bracket and the 1, 2 and 3 setting levers. The greater the clearance, the heavier the key touch will be.

Reason: To reduce the variation in height of keytops in their restored position.

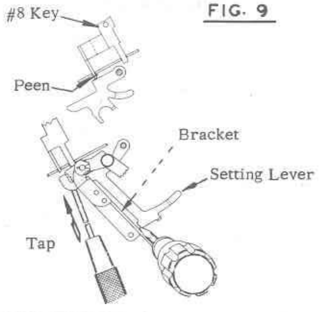
ADJ. 12 SELECTION

NOTE: The following adjustments (Figures 9, 10 and 11) must be made simultaneously since a change in one will affect the others. The sequence in selection must always be: pin set, sector release, carriage escapement, although the timing between them may vary.



SHORTENING SETTING LEVERS

FIG. 9



LENGTHENING SETTING LEVERS

FIG. 9 SETTING LEVERS

The setting pin should snap into place and be detented by the spring before the selection key is fully depressed. Adjust by lengthening or shortening the setting levers.

To shorten a setting lever: place a screwdriver between the setting lever and the setting pin and press down on the selection key.

To lengthen a setting lever: (#1 thru #4) place a screwdriver, or suitable block, between the setting lever and the bracket, then tap on the setting lever with a punch as illustrated. (#5 thru #8) lengthen the selection key by peening the lower end where it contacts the setting lever, since the setting levers are too short to form.

Reason: So pin will be set at proper time and be fully detented, if the pin is not fully detented it may be released during repeat add. If a setting lever is too long it may not be fully restored when the carriage escapes and catch on a setting pin in the next order.

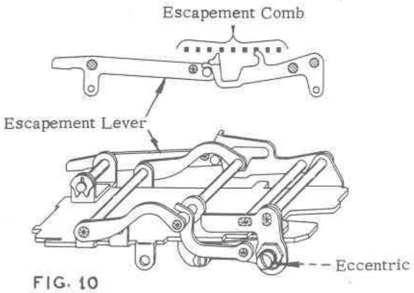


FIG. 10

FIG. 10 CARRIAGE ESCAPEMENT

The carriage escapement is to occur near the bottom of the selection key stroke after the sector has been released. Adjust at eccentric. Test each key in all carriage positions.

ADJ. 12 SELECTION

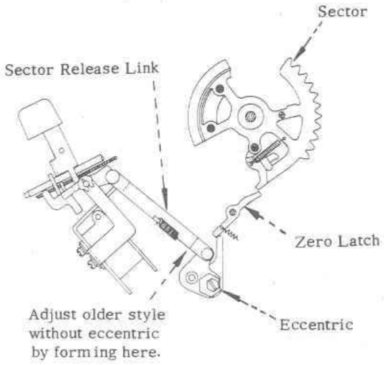


FIG. 11

FIG. 11 SECTOR RELEASE

The sectors are to release after the pins have been set, but before the escapement pawl releases comb. Adjust at the eccentric, keep the lobe forward. To adjust older style, without eccentric, shorten or lengthen link at form.

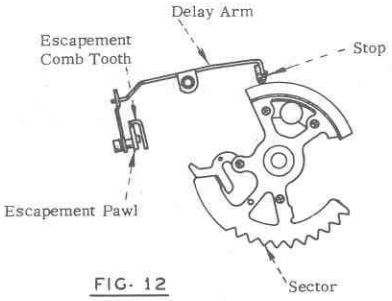


FIG. 12

FIG. 12 SECTOR DELAY MECHANISM

With the carriage in home position, slowly depress a selection key, the pin will be set and the sector will be released. As the sector begins to rotate it should contact the beveled surface of the nylon stop rocking it up, the front end of the delay arm should push the escapement pawl down, allowing the carriage to move against the holding pawl. Check in all orders. With a selection in all orders manually push the carriage to the right, the tooth of the escapement pawl should be held below the comb. Adjust by forming the front end of the delay arm.

ADJ. 13 KEYBOARD INTERLOCK

No CLEARANCE No PRESSURE

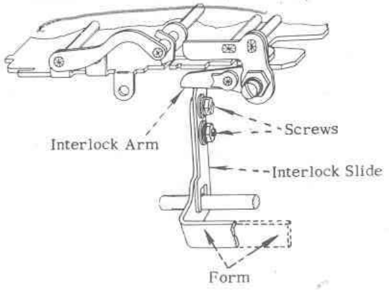


FIG. 1 INTERLOCK CLEARANCE

Hold down add key. Loosen screws and raise the keyboard interlock to contact, but not bind, the interlock arm. With machine in home position the interlock must pass freely under the arm with a minimum of clearance.

FIG. 2 INTERLOCK ENGAGEMENT

With the plus key depressed and the drive shaft half cycled, the selection interlock is to be positioned so the interlock arm has 100% engagement to the interlock slide. To adjust form the bail at points shown.

ADJ. 14 CARRIAGE RESTORE

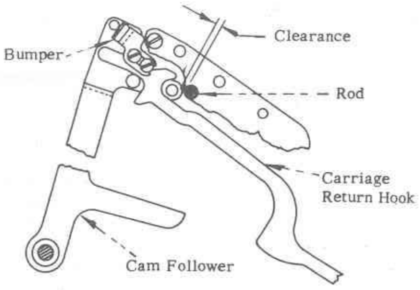


FIG. 1

FIG. 1 CARRIAGE RETURN CAM FOLLOWER

Adjust bumper so that the cam follower does not contact the rod or the carriage return hook when the carriage is in home position.

Reason: So carriage is not restricted in last position.

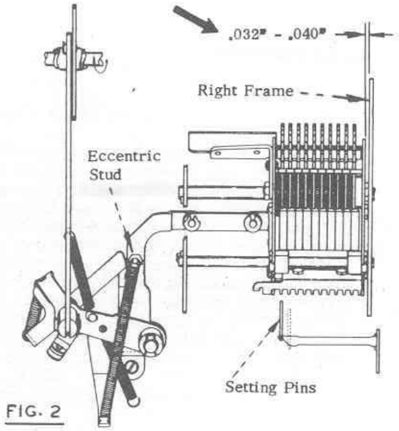


FIG. 2

FIG. 2 CARRIAGE RETURN ARM

During carriage restore when carriage is at its maximum travel to the right, there should be .032" to .040" clearance between the carriage frame and the right side frame. Adjust at the eccentric, keep lobe to the left.

Reason: So the carriage will be returned far enough to restore all setting pins.

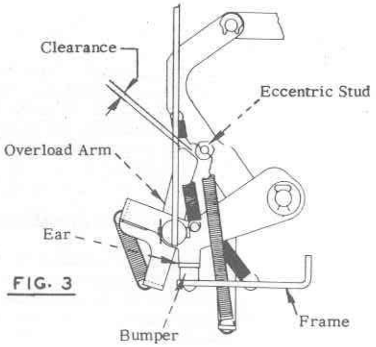


FIG. 3

FIG. 3 CARRIAGE RETURN ARM BUMPER

When the carriage is fully escaped, there should be a small clearance between the overload arm and the eccentric. Adjust by forming the ear which contacts the rubber bumper, the ear should be formed to contact the bumper as squarely and as fully as possible to reduce wear. In older machines the bumper was on the ear but the adjustment is the same.

Reason: So the carriage will not be restricted in the last position.

ADJ. 15 FUNCTION INTERLOCK LATCH ("AC-AF" type)

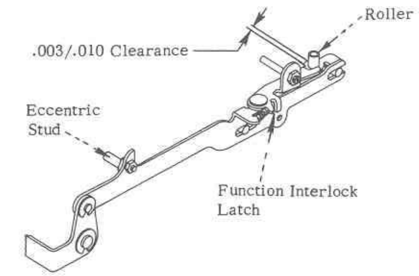


FIG. 1 LATCH RESTORE

With the machine in home position there should be .003" to .010" clearance between the latch and the roller. Adjust at the eccentric.

Reason: To insure that the roller will not restrict the restore of the latch.

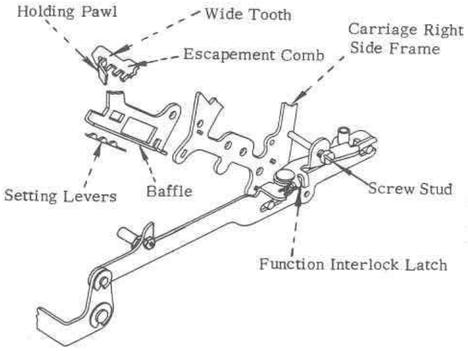
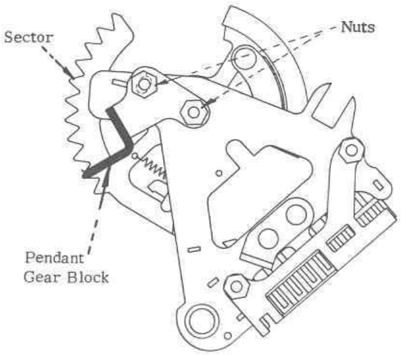


FIG. 2 LATCH TRIP

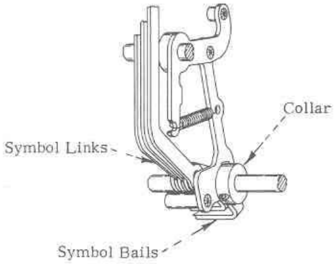
The function interlock latch is to be tripped as the carriage is restoring, just before it has reached its maximum throw. When the latch trips the wide tooth of the comb must be under the lip of the holding pawl and the baffle over setting levers. Adjust at the screw stud.

ADJ. 16 PENDANT GEAR BLOCK



With the sectors in zero position, the pendant gear block must align with a row of sector teeth. Loosen nuts to adjust. The block must be as level as possible with a row of sector teeth.

ADJ. 17 ALIGNMENT OF SYMBOL LINKS AND BAILS



Move collar to reduce side play to a minimum, while not restricting the movement of the parts or causing binds.

ADJ. 18 ACCUMULATOR

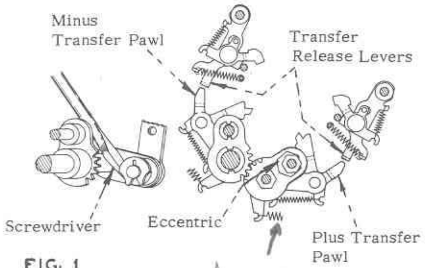


FIG. 1

FIG. 1 TRANSFER CONTROL BAILS

With the accumulator out of the machine, insert a screwdriver as shown and pry up on the point. The tips of the transfer pawls should pull away from the ears of the transfer release levers at approximately the same time. Adjust at the eccentric.

The transfer control bails must move freely. With the bails rocked out, tripping a single transfer should cause the bails to rock in.

Reason: To insure that the transfer control bails have equal movement.

weak SPRING will CAUSE TRANSFER FAILURE

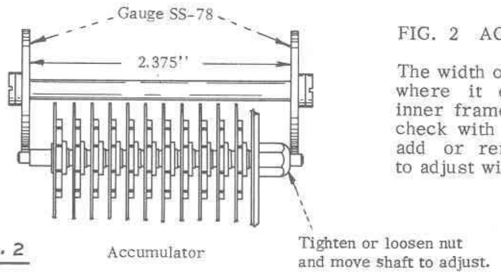


FIG. 2

FIG. 2 ACCUMULATOR WIDTH

The width of the accumulator at the points where it engages the right and left inner frames must be 2.375" (2 3/8"), check with gauge SS-78. On older style, add or remove shims under left nut to adjust width.

ADJ. 18 ACCUMULATOR

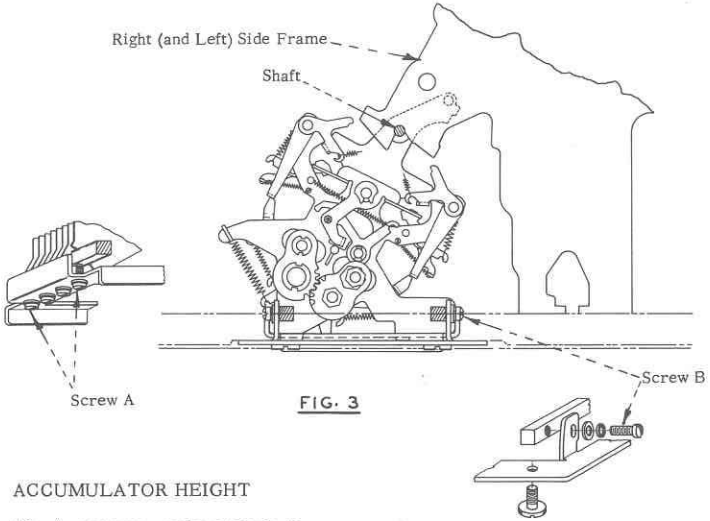


FIG. 3

FIG. 3 ACCUMULATOR HEIGHT

Tighten (8) A screws, only enough to collapse the lockwashers, further tightening will distort frames and cause binds. Turn the machine over, so it rests on the keyboard. Have (4) B screws loose, install the accumulator in the machine so the shaft is seated in the slots in the right and left side frames. Press the accumulator lightly into the machine, do not force, so the shaft is firmly seated in the slots, hold in place and tighten (4) B screws.

Reason: To align accumulator with machine. Once this adjustment has been made the accumulator may be removed and replaced without additional adjustment.

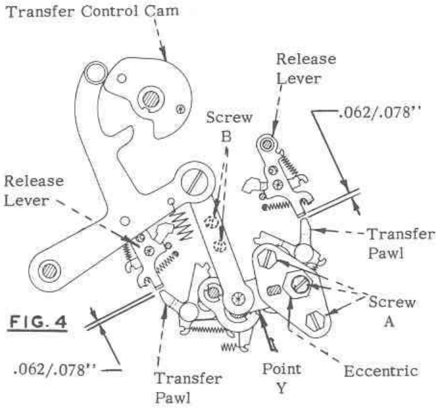


FIG. 4

FIG. 4 TRANSFER PAWL LATCHING

Rotate the drive shaft to position the transfer control cam as shown. Clearance between the tip of the transfer pawls and the ear on the release levers should be .062" to .078". (Use the medium and large allen wrenches as gauges.) Loosen screws A and adjust at eccentric.

The older style, without the eccentric, is adjusted by loosening screws B and shortening or lengthening link as required. After adjusting press up at point Y with a screwdriver, the roller should move away from the cam slightly, if not the adjustment is too tight and wear will result.

Reason: To provide sufficient overtravel of transfer pawls to insure safe latching.

ADJ. 18 ACCUMULATOR

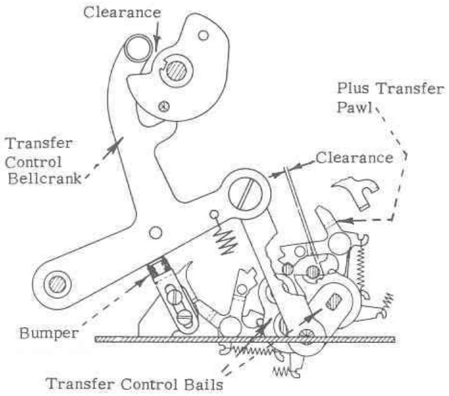
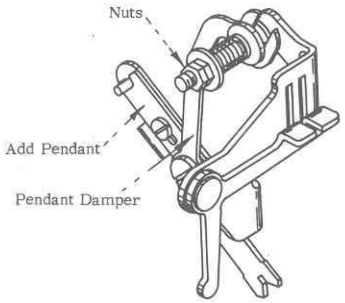


FIG. 5 TRANSFER CONTROL
BELLCRANK BUMPER

With the drive shaft in home position, release the last order plus transfer pawl. There should be clearance between the transfer control bail and the transfer pawl. Adjust by raising or lowering the bumper as required, the bumper should by slightly compressed.

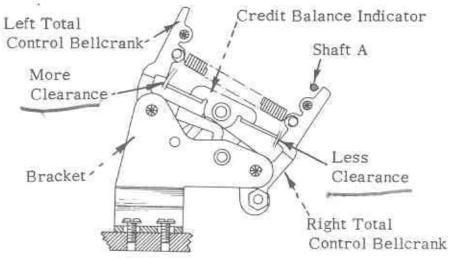
Reason: To provide a stop for the transfer control bellcrank when the transfer release occurs.

ADJ. 19 ADD PENDANT DAMPER



Tighten nuts to reduce add pendant oscillation, but not so tight pendant movement is restricted. Usually this adjustment will be correct when about 4 threads are showing.

ADJ. 20 CREDIT BALANCE INDICATOR



When the drive shaft cycles one-quarter turn the credit balance indicator should rotate freely. There should be slightly more clearance between the credit balance indicator and the left total control bellcrank. Adjust by moving bracket. The right total control bellcrank must not contact shaft A of the subtract pendant during a positive total or subtotal.

ADJ. 21 PENDANT ALIGNER

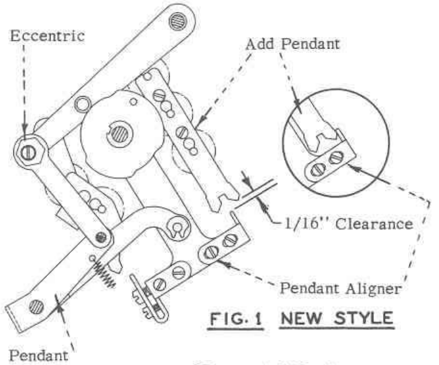


FIG. 1 NEW STYLE

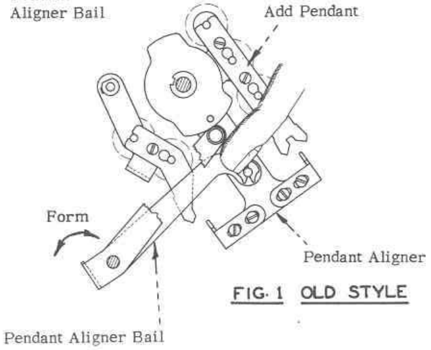


FIG. 1 OLD STYLE

FIG. 1 DISENGAGED POSITION

With the drive shaft in home position there should be 1/16" clearance between the point of the aligner and the add pendant. Use a 1/16" (medium size) allen wrench as a gauge. Adjust at the eccentric. Older, spring driven style, without eccentric, is adjusted by forming the bail to provide the required clearance.

Depress the total key and rotate the drive shaft one-quarter turn. The pendant should engage the pendant as shown in the inset.

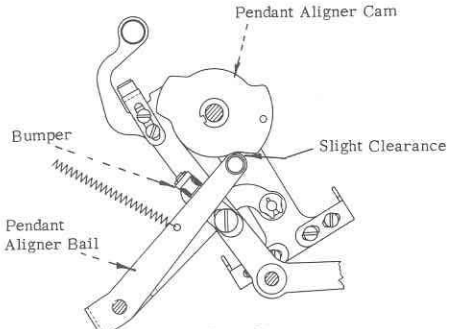


FIG. 2

FIG. 2 PENDANT ALIGNER
BUMPER (Spring Driven Style only)

With pendant aligner cam in position shown, adjust bumper to provide a slight clearance between the roller and the cam. This adjustment must not interfere with the proper engagement of the pendant aligner.

ADJ. 21 PENDANT ALIGNER

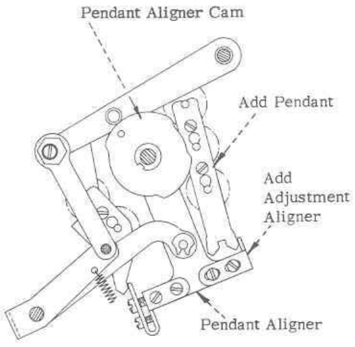
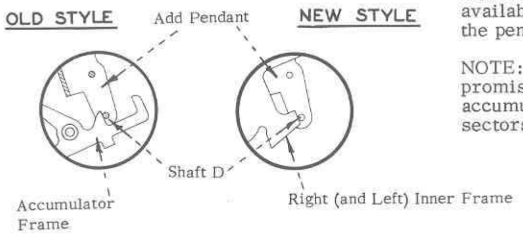


FIG. 3

FIG. 3 PENDANT ENGAGED WITH ACCUMULATOR

With machine conditioned for a positive total, depress the total key and cycle the machine until the pendant aligner engages the add pendant as shown. Shaft D of the add pendant should be against the stops on the left and right inner frames. In older machines shaft D should be against the stop on the accumulator frames. Adjust by moving the add adjustment aligner or by using a different thickness of aligner, 3 thicknesses are available. The aligner should engage the pendant without force.

NOTE: This adjustment must be a compromise between engagement with the accumulator and engagement with the sectors (Figure 4).



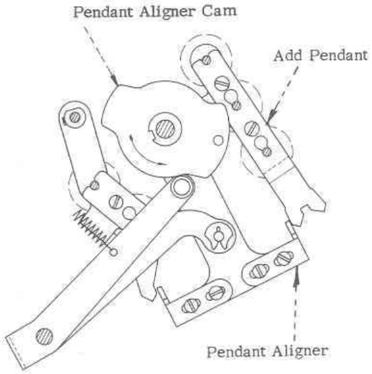


FIG. 4

FIG. 4 PENDANT ENGAGED WITH SECTORS

Depress the add key and cycle the machine until the pendant aligner engages the add pendant as shown. The add pendant gear should be fully engaged with the sectors, without bottoming. Adjust as in Figure 3 above.

ADJ. 21 PENDANT ALIGNER

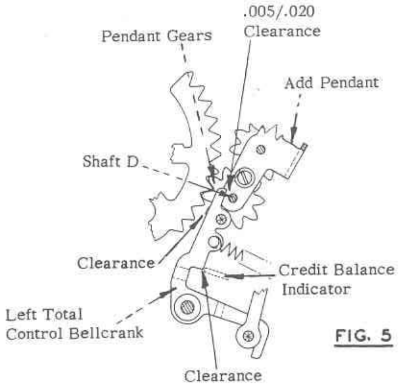
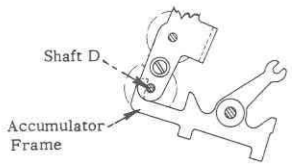


FIG. 5



OLD STYLE

FIG. 5 LEFT TOTAL CONTROL BELLCRANK

Cycle the drive shaft until the pendant gears are fully meshed with the sectors or, in older models, when shaft D of the add pendant is against the stop on the accumulator frame. There should be .005" to .020" clearance between shaft D and the left total control bellcrank, form the bellcrank if necessary. The credit balance indicator must clear the corner of the bellcrank and bellcrank must clear the sector teeth.

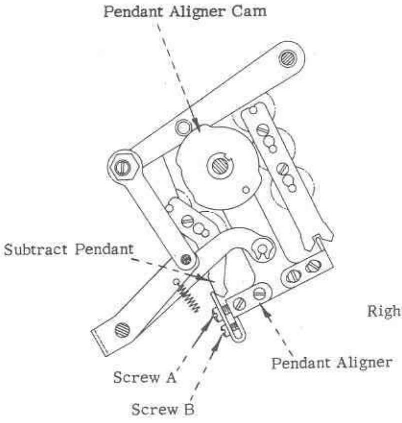
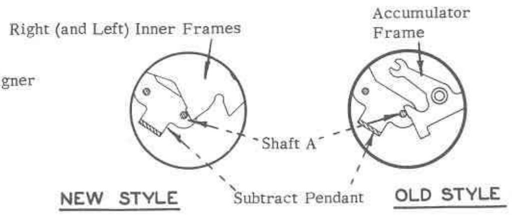


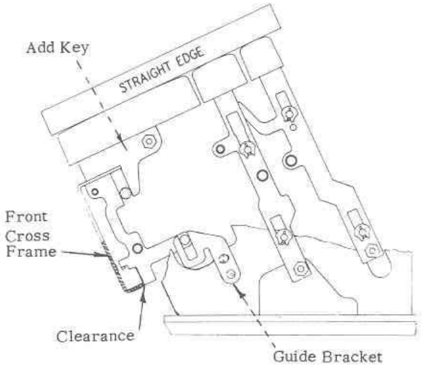
FIG. 6

FIG. 6 SUBTRACT PENDANT ENGAGED

With the machine conditioned for a negative total, depress the total key and cycle the machine until the pendant aligner engages the subtract pendant as shown. Shaft A should be against the stops on the right and left inner frames or, in older machines, against the stops on the accumulator frames. Loosen screw B and adjust screw A.



ADJ. 22 ADD KEY ALIGNMENT



NOTE: Guide bracket has been eliminated from latest machines, no adjustment is required.

The add key top should be approximately level with other key tops. The add key should not bind when the top is pressed down at extreme rear. Adjust guide bracket. There must be clearance between keystem and front cross frame.

ADJ. 23 MOTOR

FIG. 1

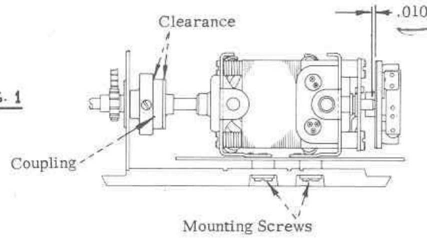


FIG. 2

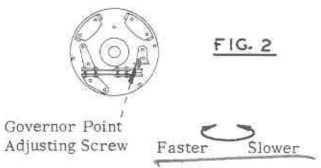


FIG. 1 ALIGNMENT

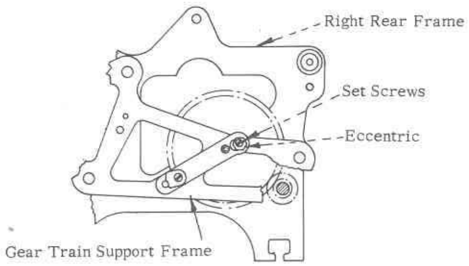
With (4) mounting screws loose and motor running, move motor to find a point of minimum vibration. Maintain clearance at coupling.

Loosen set screws and move governor to allow .010" to .030" of the brush to show.

FIG. 2 MOTOR SPEED

The motor speed for "AB" and "AC" type adding machines is 150 drive shaft cycles per minute. Adjust at the governor point adjusting screw. The speed for the add-punch and solenoid input machines is 140 cycles per minute. The AF type machines is 160 cycles per minute.

ADJ. 24 DRIVE GEAR ALIGNMENT



Loosen set screws in both frames. Rotate eccentric until the gears become noisy, then back up eccentric until the noise ceases.

ADJ. 25 CLUTCH RELEASE

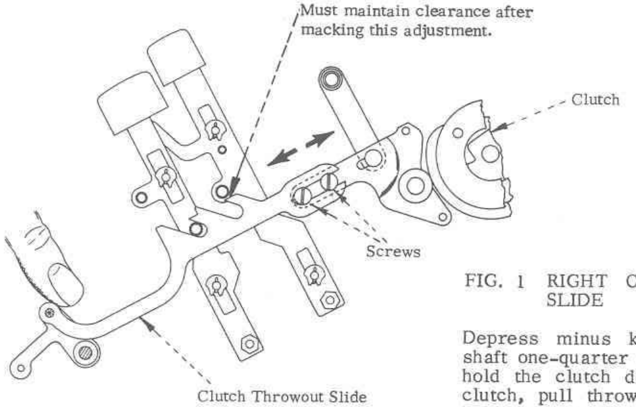


FIG. 1

FIG. 1 RIGHT CLUTCH THROWOUT SLIDE

Depress minus key and rotate drive shaft one-quarter turn. Loosen screws, hold the clutch dog latch against the clutch, pull throwout slide forward to hold the subtract key fully depressed. Check using print only key.

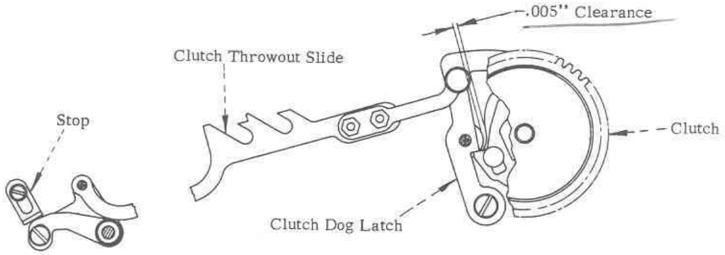


FIG. 2

FIG. 2 CLUTCH RELEASE DOG STOP ("AB" Type only)

In home position there should be .005" clearance between the roller of the clutch dog latch and the periphery of the clutch disc. Adjust by moving stop.

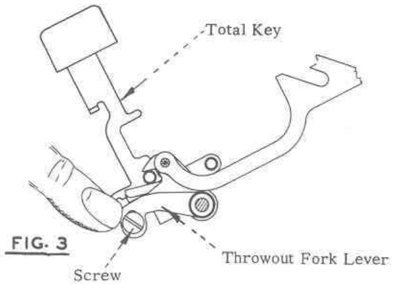


FIG. 3

FIG. 3 CLUTCH THROWOUT SHAFT

Depress the total key and rotate drive shaft one-quarter turn. Loosen the screw and press the throwout fork lever down to hold the key fully depressed. Check using the add key and the sub-total key.

ADJ. 25 CLUTCH RELEASE

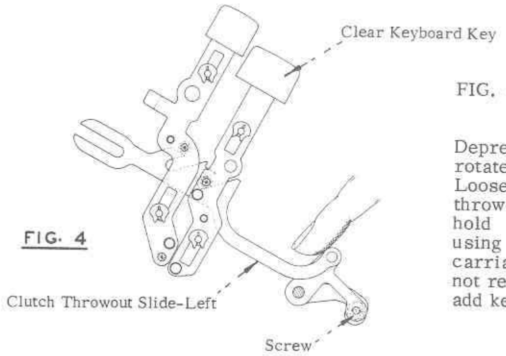


FIG. 4

FIG. 4 LEFT CLUTCH THROWOUT SLIDE

Depress the clear keyboard key and rotate the drive shaft one-quarter turn. Loosen the screw and pull the clutch throwout slide forward, as shown, to hold the key fully depressed. Check using repeat add key, see that the carriage return disabling collar does not restrict the depression of the repeat add key.

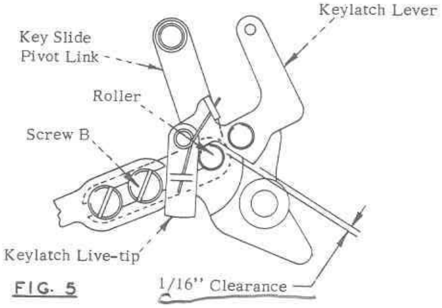


FIG. 5

FIG. 5 KEY LATCH

Depress any function key and rotate the drive shaft one-half turn. There should be approximately 1/16" clearance between the roller and the keylatch lever. To adjust, loosen screw B only and move the key slide pivot link as required.

Reason: To insure the roller engaging the keylatch lever not the key latch live-tip.

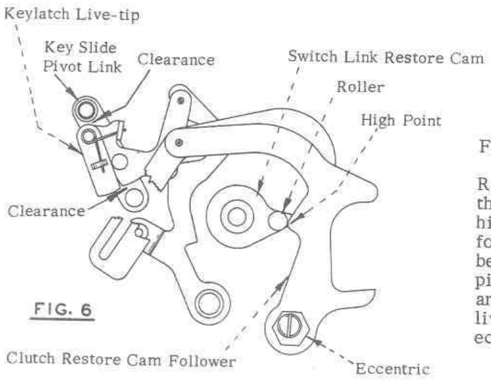


FIG. 6

FIG. 6 CLUTCH RESTORE

Rotate drive shaft until the roller on the switch link restore cam is on the high point of the clutch restore cam follower. There should be clearance between the roller on the key slide pivot link and the key latch live-tip and also between the top of the key latch live-tip and the stud. Adjust at the eccentric, keep lobe downward.

ADJ. 25 CLUTCH RELEASE

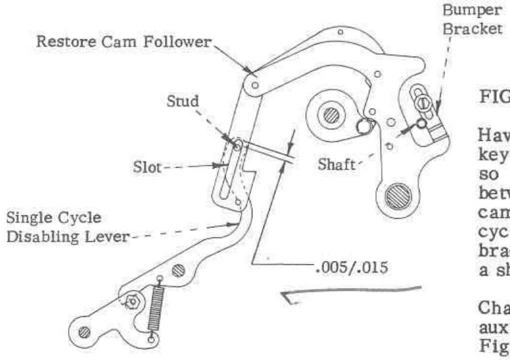


FIG. 7

FIG. 7 CLUTCH RESTORE CAM FOLLOWER

Have the machine in home position, no keys depressed. Adjust the bumper bracket so there is .005" to .015" clearance between the end of the slot on the restore cam follower and the stud on the single cycle disabling lever. NOTE: The bumper bracket is also used as a retainer for a shaft.

Changing this adjustment will affect the auxiliary switch lever, Adjustment 26, Fig. 2.

On machines not having the single cycle disabling lever, adjust in home position, by bringing the bumper bracket down to just compress the rubber bumper.

ADJ. 26 MICRO SWITCH

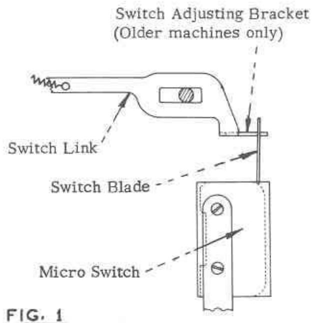


FIG. 1

FIG. 1 MOTOR STARTING

With the power on, hold the switch link and depress any function key. Let the switch link come forward slowly. The motor should start before the clutch engages. Adjust by forming the switch blade. On older machines move the switch adjusting bracket instead of bending the ear.

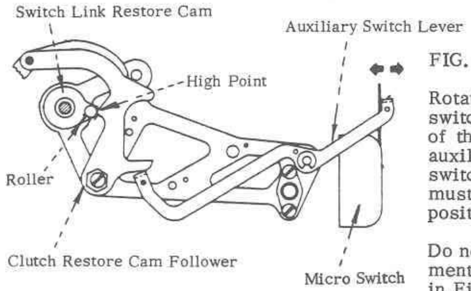


FIG. 2

FIG. 2 AUXILIARY SWITCH LEVER

Rotate the drive shaft until the roller of the switch link restore cam is on the high point of the restore cam follower. The ear of the auxiliary switch lever should keep the micro-switch closed. The auxiliary switch lever must allow the microswitch to open in home position. Form the ear to adjust.

Do not form switch blade to make this adjustment as it will upset the adjustment made in Fig. 1.

ADJ. 27 ADD PENDANT CONTROL

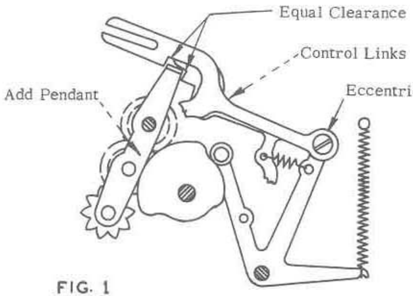


FIG. 1

FIG. 1 ADD PENDANT CONTROL LINKS (AC - AF type)

With the machine in home position there should be equal clearance between the control links and the lip of the add pendant. Adjust at the eccentric.

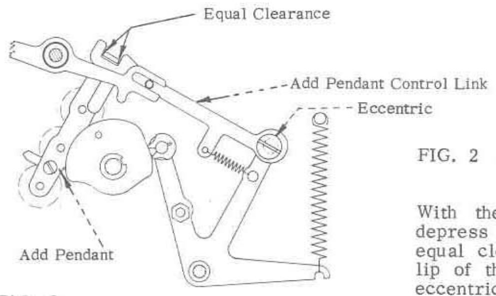


FIG. 2

FIG. 2 ADD PENDANT CONTROL LINK ("AB" type)

With the machine in home position, depress the add key. There should be equal clearance on both sides of the lip of the add pendant. Adjust at the eccentric.

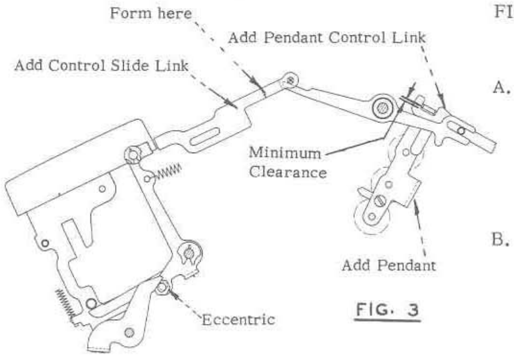


FIG. 3

FIG. 3 ENGAGEMENT OF ADD PENDANT CONTROL LINK ("AB" type)

A. When the add key is held fully depressed, there should be a minimum of clearance between the under side of the lip on the add pendant and the add pendant control link. Adjust by forming add control slide link.

B. When the repeat add key or the clear keyboard key is held fully depressed, there should be a minimum of clearance between the under side of the lip on the add pendant and the add pendant control link. Adjust at the eccentric.

ADJ. 27 ADD PENDANT CONTROL

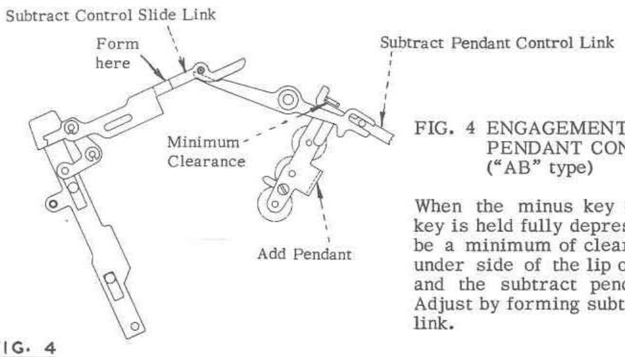


FIG. 4

FIG. 4 ENGAGEMENT OF ADD PENDANT CONTROL LINK ("AB" type)

When the minus key or the print only key is held fully depressed, there should be a minimum of clearance between the under side of the lip on the add pendant and the subtract pendant control link. Adjust by forming subtract control slide link.

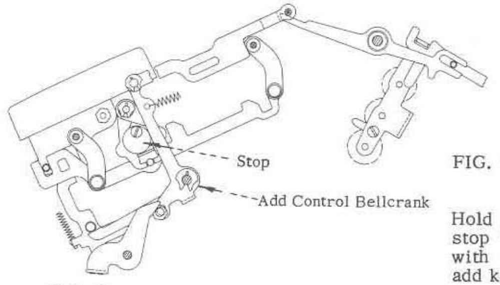
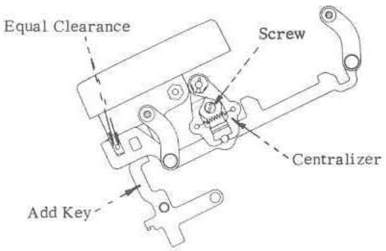


FIG. 5

FIG. 5 STOP FOR ADD CONTROL BELLCRANK ("AB" type)

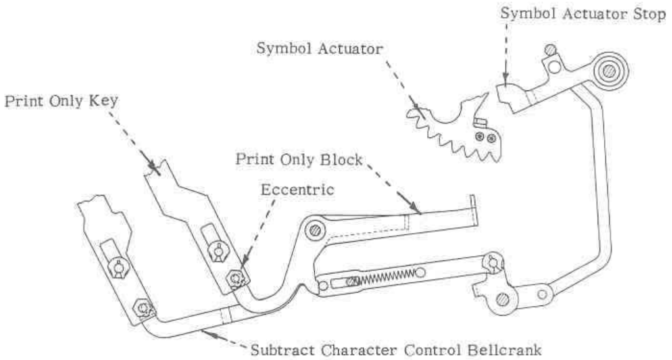
Hold the add key depressed and set the stop to just contact the bellcrank. Test with clear keyboard key and repeat add key.

ADJ. 28 INTERLOCK SLIDE CENTRALIZER



Depress add key. Loosen screw and adjust the centralizer to provide equal clearance on both sides of the stud on the add key.

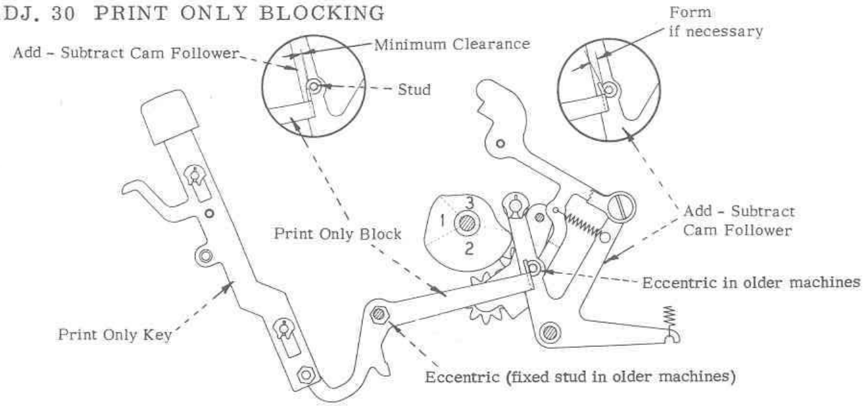
ADJ. 29 PRINT ONLY SYMBOL



With the machine in home position, the print only block should just touch the stud on the subtract character control link. Adjust at the eccentric on the print only key. Check to see that the symbol actuator is stopping against the upper face of the actuator stop with a good bite.

CAUTION: The subtract character control bellcrank must be adjusted so it does not interfere with this adjustment. (See Adjustment 38.)

ADJ. 30 PRINT ONLY BLOCKING



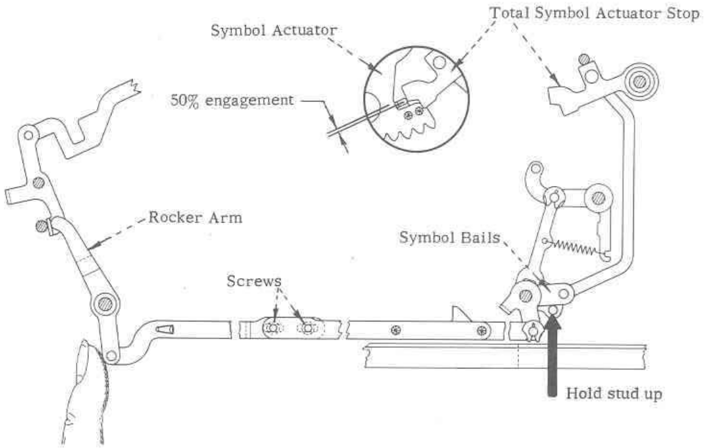
Depress the print only key to a point where the top of the ear on the print only block is even with the stud on the add-subtract cam follower, there should be a minimum of clearance at this point but the ear must not touch the stud. Adjust at the eccentric.

With the print only key fully depressed, there must not be so much clearance between the stud and the ear that the cam follower is not held away from the cam. Adjust at the eccentric. If the clearance between the top of the ear and the stud is at a minimum and the clearance to the stud with the key fully depressed is too great, form the top of the ear away from the stud then readjust the eccentric.

On older machines the eccentric is on the add-subtract cam follower and the stud in the frame is fixed, the adjustment is the same.

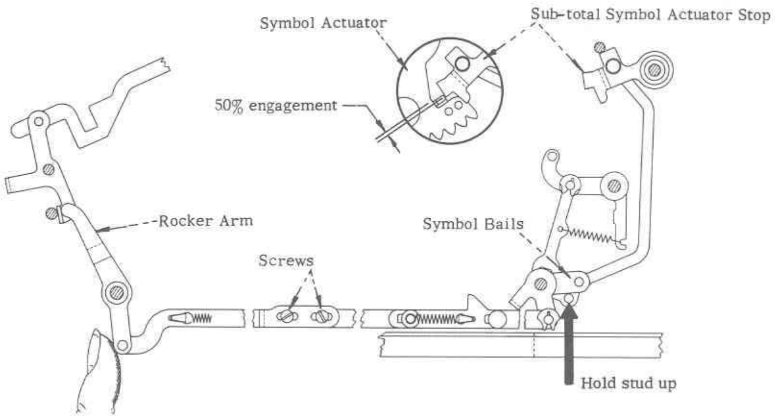
Reason: So the add pendant is not allowed to move into mesh with the accumulator during a print only operation.

ADJ. 31 TOTAL SYMBOL ACTUATOR STOP



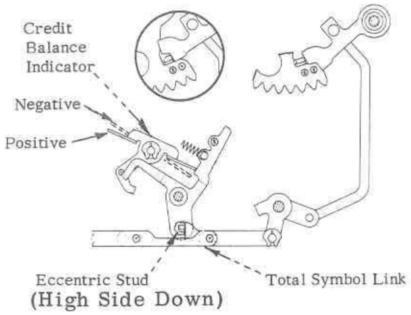
With the machine in home position, loosen the screws enough to allow parts to slip, hold the stud up against the symbol bails and press on the rocker arm as shown, tighten screws. Check to see that the ear on the symbol actuator engages at least 50% of the upper face of the total symbol actuator stop during a positive total. Check with negative (credit balance) total. CAUTION: See that the eccentric stud on the right total control bellcrank is not raising the symbol stop.

ADJ. 32 SUB-TOTAL SYMBOL ACTUATOR STOP



With the machine in home position, loosen the screws enough to allow parts to slip, hold the stud up against the symbol bails and press on the rocker arm as shown, tighten screws. Check to see that the ear on the symbol actuator engages at least 50% of the upper face of the sub-total symbol actuator stop during a positive sub-total. Check with negative (credit balance) sub-total. CAUTION: See that the eccentric stud on the right total control bellcrank is not raising the symbol stop.

ADJ. 33 TOTAL CONTROL BELLCRANK SYMBOL ACTUATOR STOP



Position the credit balance indicator for a positive total, as shown. Depress the total key and cycle drive shaft, the eccentric stud should come up and just touch, without moving, the ear on the total symbol link. Repeat using sub-total key. Adjust eccentric stud. Check with credit balance indicator in negative (dotted) position.

ADJ. 34 RIBBON FEED

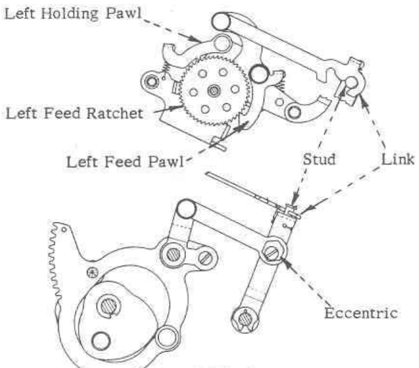


FIG. 1

FIG. 1 LEFT RIBBON FEED

With the stud engaging the front notch of the link, as shown, rotate drive shaft. The left feed pawl should rotate the left feed ratchet about 2 1/2 teeth past the left holding pawl. Adjust at eccentric.

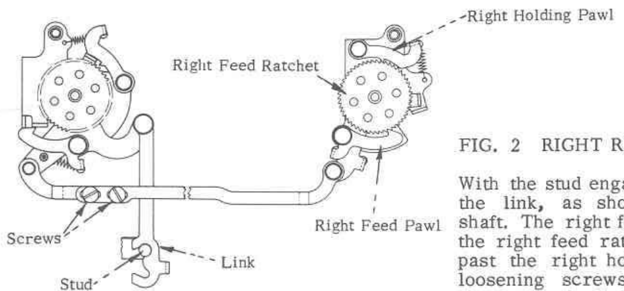


FIG. 2

FIG. 2 RIGHT RIBBON FEED

With the stud engaging the rear notch of the link, as shown, rotate the drive shaft. The right feed pawl should rotate the right feed ratchet about 2 1/2 teeth past the right holding pawl. Adjust by loosening screws and lengthening or shortening the link as required.

ADJ. 35 RIBBON HEIGHT

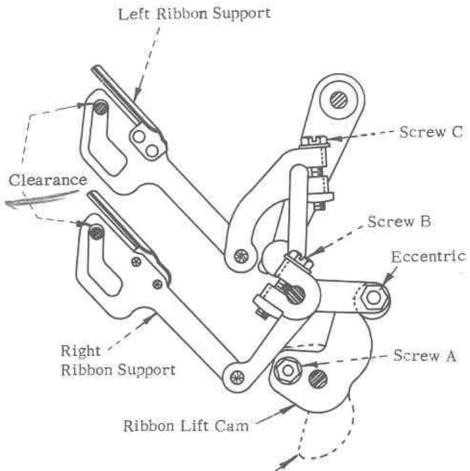


FIG. 1

FIG. 1 RIBBON SUPPORTS
(AC - AF type)

With machine in home position, loosen screw A, rotate ribbon lift cam to its maximum forward position tighten screw. Loosen screw B, press down on right ribbon support, tighten screw. Loosen screw C, depress and hold the clear keyboard key while holding the left ribbon support down, tighten screw. Adjust the eccentric to provide a slight clearance between the top of the slot in the ribbon support and the roller.

On older "AC" machines there were two ribbon lift cams, the lower one was found to be unnecessary and may be removed from any machine. If the lower cam is not removed, it should be adjusted so the numerals strike the center of the red portion of the ribbon during a negative operation.

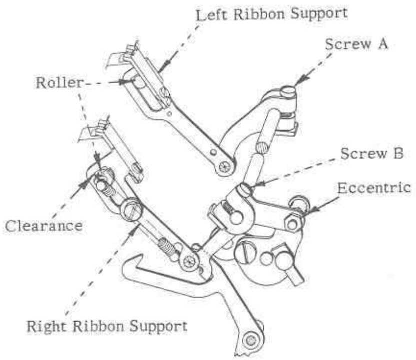


FIG. 2

FIG. 2 RIBBON SUPPORTS ("AB" type)

With machine in home position press down on the right ribbon support, there should be a small amount of clearance between the top of the slot in the support and the roller, adjust at the eccentric.

Hold the right ribbon support down, loosen screw A and press the left ribbon support down so the top of the slot is against the roller. Tighten screw.

Adjust screw B so numeral strike in the center of the red portion of the ribbon during a negative operation.

ADJ. 36 PAPER FEED BLOCK

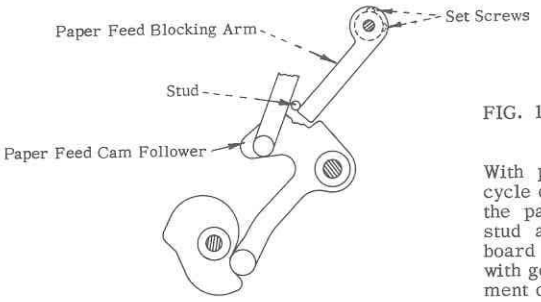


FIG. 1

FIG. 1 PAPER FEED BLOCK
("AC" and "AF" type)

With paper feed set for double space, cycle drive shaft to position shown. Move the paper feed blocking arm to touch stud as shown. Check with clear keyboard key, arm should block the stud with good engagement, to prevent movement of the paper feed cam follower.

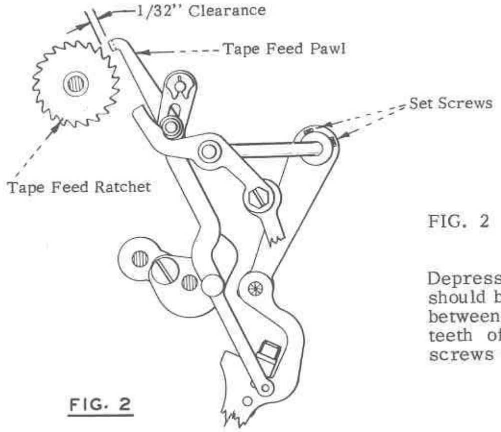
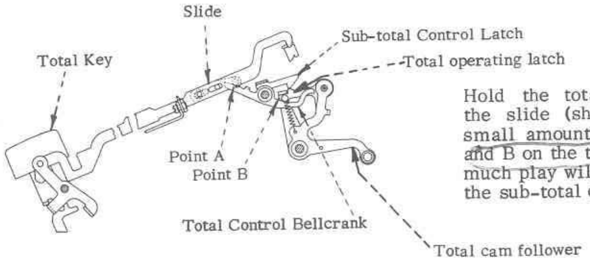


FIG. 2

FIG. 2 PAPER FEED BLOCK
("AB" type)

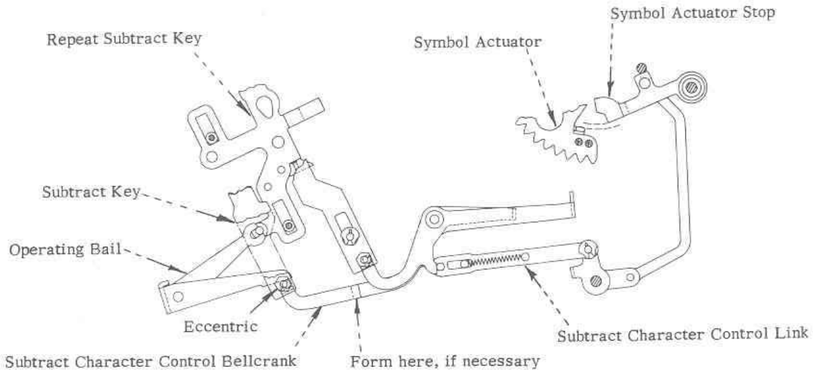
Depress the clear keyboard key. There should be approximately 1/32" clearance between the lip of the feed pawl and the teeth of the tape feed ratchet. Loosen screws to adjust.

ADJ. 37 TOTAL SLIDE



Hold the total key depressed. Adjust the slide (shown dotted) to provide a small amount of play between points A and B on the total control bellcrank. Too much play will prevent disengagement of the sub-total control latch.

ADJ. 38 SUBTRACT AND REPEAT SUBTRACT

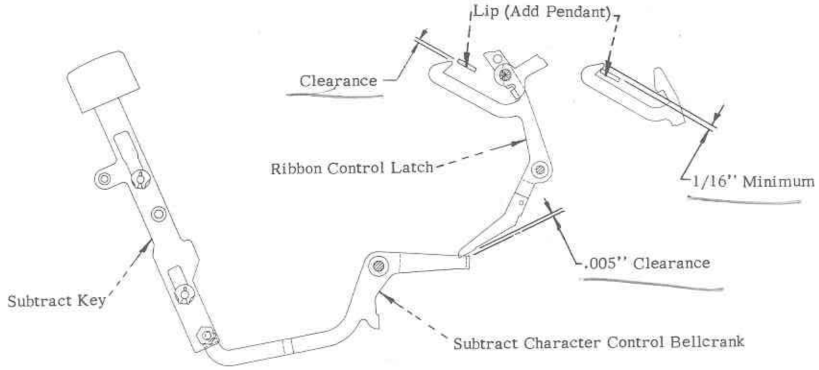


In home position the operating bail should hold the repeat subtract key with no up and down play. Adjust at the eccentric on the subtract key.

Depress subtract key and cycle machine the ear on the symbol actuator must stop against the lower face of the symbol actuator stop. To adjust, form the subtract character control bellcrank then readjust the eccentric, if necessary.

The subtract character control bellcrank must not push against the stud on the subtract character control link to such an extent that the stop can interfere with the ear on the symbol actuator when no key is depressed.

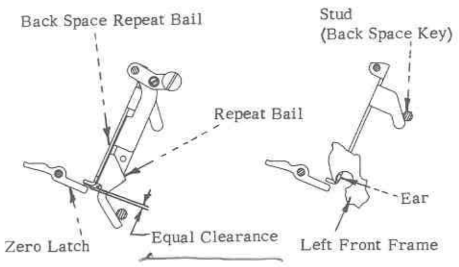
ADJ. 39 COLOR LATCH



With the machine in home position, there should be about .005" clearance between the ribbon control latch and the ear on the subtract character control bellcrank. There should also be clearance between the point of the ribbon control latch and the lip of the add pendant. Form the bellcrank to adjust.

With the machine in home position and the subtract key depressed, the point of the ribbon control latch should be at least 1/16' above the lip of the add pendant.

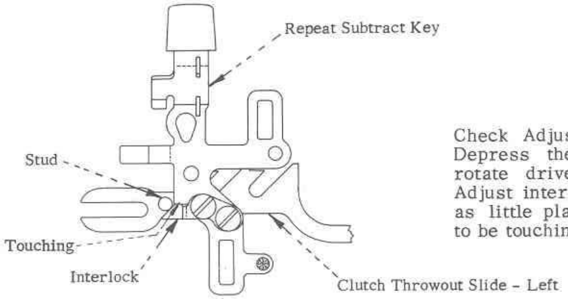
ADJ. 40 REPEAT BAILS



Escape carriage to extreme left, depress the repeat add key. There should be approximately equal clearance between the bails and the zero latches. Adjust by moving bracket or forming the lip of the repeat bail if necessary.

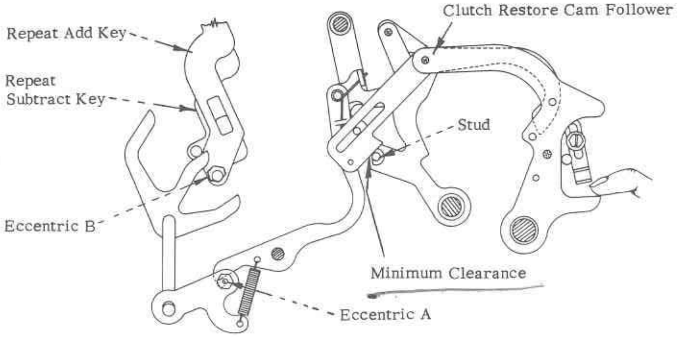
Restore carriage and depress back space key. Check that the key depression is not limited by the ear on the repeat bail hitting the left front frame. Adjust by rotating the stud on the keystem, if the stud is riveted adjust by twisting the keystem near the stud.

ADJ. 41 REPEAT SUBTRACT CLUTCH OPENING



Check Adjustment 25, clutch release. Depress the repeat subtract key and rotate drive shaft one-quarter turn. Adjust interlock to hold key down with as little play as possible. Interlock is to be touching the key as shown.

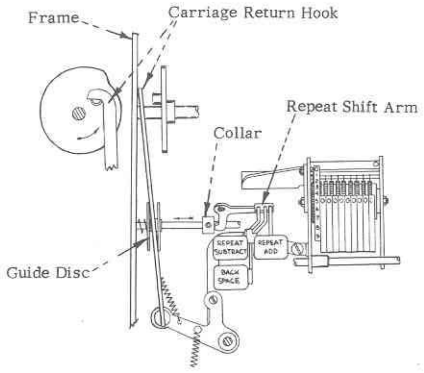
ADJ. 42 SINGLE CYCLE DISABLING



With the machine in home position and the repeat subtract key held depressed, there should be a minimum of clearance between the stud and the clutch release cam follower. Adjust at eccentric A. Repeat test using the repeat add key. Adjust for minimum clearance at eccentric B.

Cycle machine with both repeat add key and repeat subtract key, when the key restores the clutch restore cam follower should have at least 50% engagement with the stud.

ADJ. 43 DISABLING OF CARRIAGE RETURN

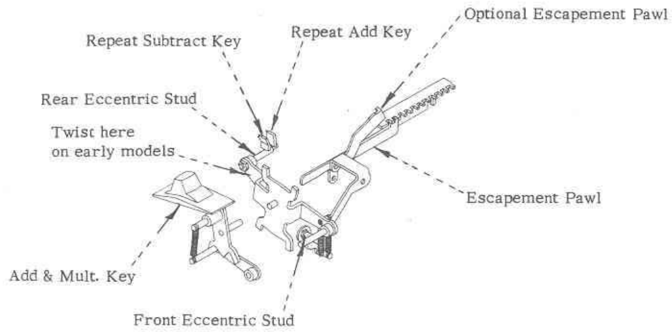


Depress the repeat add key and rotate the drive shaft one-half turn, the carriage return hook should touch the frame or the guide disc should touch the hub. Adjust by moving collar.

Check using the repeat subtract and back space keys, if adjustment is needed, bend ears on the repeat shift arm.

The carriage return hook hitting the frame must not restrict the depression of the keys.

ADJ. 44 OPTIONAL CARRIAGE ESCAPEMENT



Adjust the rear eccentric (on early models, twist the ear of the escapement pawl actuating lever) to give equal movement of the optional escapement pawl with depression of either the repeat add or repeat subtract key.

Adjust the front eccentric so the clutch is engaged at the same time, or just before, the escapement lever goes below the comb tooth.

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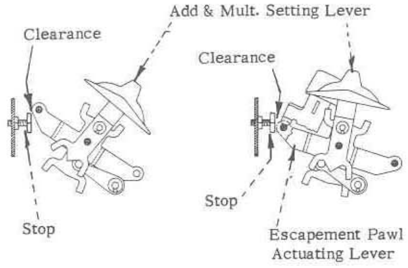
Revised
6-10-65

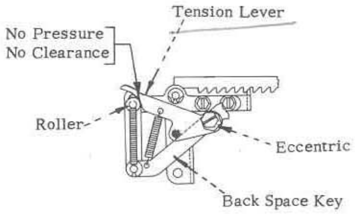
ADJ. 45 OPTIONAL ESCAPEMENT SETTING LEVER



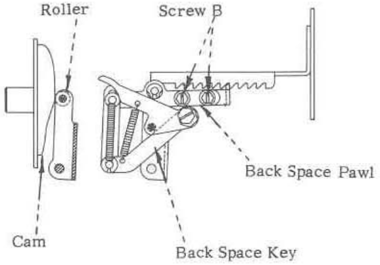
With the setting lever in the forward (add) position, adjust stop to provide a small clearance to the actuating lever.

With the setting lever in the rear (mult.) position, depress the repeat subtract key and partially cycle the drive shaft, there should be some clearance between the stop and the actuating lever.

ADJ. 46 CARRIAGE BACK SPACE



With the back space key held depressed, there should be no clearance between the tension lever and the roller and no pressure on the roller. Adjust at eccentric.



When the machine is cycled, the back space pawl should move the carriage approximately 1-3/4 spaces to the right. Adjust at screws B.

In early machines without tension lever, the pawl adjustment must be made very carefully to insure the carriage does not backspace two spaces sometimes.

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PREFACE

These notes are not intended to replace the Adding Machine adjustment manual, but only to supplement it. Read the adjustment in the manual first, then read the corresponding adjustment in this work book. Read each thoroughly before attempting to make any adjustment. Refer back to both books for all instructions as you make the adjustments.

Try to make as many of the adjustments as you can with only the help of the adjustment manual and this workbook. However, it is first of all most important that you fully understand all material, so ask for the help of your instructor, when necessary, to answer any and all questions that you might have.

Your suggestions for improvement of this manual are welcomed and urged.

SUPPLEMENTARY ADJUSTMENT EXPLANATIONS

Adj. 1 Fig. 1

The actuator does not have to be in the middle of the pendant gear, however, it must not run out of mesh with the pendant gear during its full travel. It is possible to bind the actuators by moving the comb too far to the right or left so be sure to check the actuators for free movement in the slots of the comb.

Adj. 1 Fig. 2

The subtract pendant is movable to the right or left approximately .020" by means of the adjusting screws on the right and left side frame. The actuators must maintain a full bite with the subtract pendant gears for their full travel. If the adjustment cannot be made with the adjusting screws, it may be necessary to re-adjust the guide comb, Adj. 1, Fig. 1. There should be a minimum but detectable amount of side movement of the subtract pendant to insure its freeness.

Adj. 1 Fig. 3

The backup pawls are adjusted laterally as a unit for engagement with the actuators. The actuators should engage only the roller portion of the backup pawls align the majority of the backup pawls by the adjusting screws and if necessary, form the remaining few for proper engagement. There must be minimum but detectable amount of side play of the backup pawl guide comb.

Adj. 2

The .015" clearance of the backup pawls not only represents good disengagement, but also good engagement of the backup pawl rollers into the valleys of the actuator teeth. If the rollers do not bottom fully into the valleys, they will not reliably prevent actuator downward movement. On the other hand there should be positive clearance to the tips of the actuator teeth when the backup pawls are disengaged. It has been found that if the tip of an actuator tooth could just flick the backup pawl, this could be enough to slow the actuator down during the actuator downstroke and possible cause an error.

Manually release the clutch and cycle the drive chaft until the tips of the actuator teeth are at their closest point to the backup pawl rollers. The clearance is best observed by inserting a piece of white paper or tape in front of the backup pawls (accumulator removed). The clearance should be as stated in the adjustment manual.

SUPPLEMENTARY ADJUSTMENT EXPLANATIONS

Adj. 3

The rocker gear adjustment positions the actuators to the actuator stop shaft. If the actuators do not restore close enough to the stop shaft, the block drum idler gears may not position their notch under the zero foil for correct operation or the actuator may not fully turn an accumulator wheel to the detented position which might result in transfer problems.

If the actuators are against their stop with pressure, this in turn will put excessive pressure on the upper roller of the actuator cam follower eventually resulting in its failure.

Finally, the actuator drive shaft is almost always unlevel in machines which have had any use. This would mean that when #12 actuator is touching its stop with no pressure, #1 actuator can be pushed further upward before it touches the stop.

This is permissible to an extent. As long as at least one actuator is touching its stop with no pressure.

Loosen the adjustment so that all of the actuators are away from their stop with the machine in home position. This can be felt by pushing forward on the actuator. Then turn the rocker gear eccentric until the closest actuator just touches its stop. Tighten the adjustment and recheck.

Adj. 4

The adjustment calls for a minimum up and down play, for each print wheel assembly, of at least .015". Any less play would tend to give a tighter tooth to valley engagement of the print wheel idler gears to the block drum idler gears and this could restrict the free downward movement of an actuator.

The adjustment does not specify a maximum amount of play, but as the amount of play increases (the print assemblies up and away from the block drum idler gears) the print wheel aligners move further away from their disabling shaft and therefore begin to come close to the print wheel gears. If the print wheel aligners were close enough to be flickered by the print wheel gear during the downward movement of the actuator this could very well restrict the actuator. If a print wheel assembly has more than .015" play, it should be checked to see that the aligner does not flicker during the actuator downward stroke.

Adjust the print control bellcrank so that the tightest print assembly has at least .015" play. Then release the clutch and while the print wheel gears are rotating to nine, observe that the print wheel aligners are not flickered by the print wheel gears. In most cases, this will give you a reliable adjustment. However if some print wheel aligners flicker when the closest print assembly has .015" play, it could be caused by an incorrect adjustment of the pendant gear aligner bail (adj. 5).

SUPPLEMENTARY ADJUSTMENT EXPLANATIONS

If the pendant gear aligner bail adjustment is correct, then the print wheel tails would have to be formed. The print wheel tails are brittle and forming them should be avoided if at all possible. If they are formed, they should only be formed upward. This would increase the play in the closest print wheel so that the eccentric can be re-adjusted.

Adj. 5

The main purpose of this adjustment is to prevent the gear trains from contacting the pendant gear aligner bail and causing wrong answers. A wide clearance can cause a lock up if the front tail of the print wheel aligner contacts the rear of the print wheel aligner shaft.

Adj. 6

The adjustment points out that the upper extension of the zero foils should be .010" short of bottoming against the print wheel assembly when the first two print wheels are against the platen. The zero foil disabling shaft is holding the zero foils short of bottoming on the print wheel assemblies. This is adjustable by the eccentric stud.

Adj. 7 Fig. 1 & Fig. 2

Condition the clear signal to print (take a total or pull the clear signal latching arm forward). During an add cycle, after printing, when the zero foils are being disengaged, the clear signal relatching pawl should pull the signal far enough forward for latch 1 of the clear signal latch to relatch. With the cam follower on the high dwell of the zero block cam, check that the clear signal latching arm can be pulled forward and then return completely rearward right next to the hook at the end of the total slide.

Cycle the machine to home position (medium dwell of the zero block cam). Pull the clear signal latching arm forward to delatch latch 1. The clear signal should escape slightly rearward and limit on the print control arm. There should be a slight clearance between stud X on the clear signal and lip Y to insure that latch 1 will remain delatched after a total cycle.

Adj. 7 Fig. 3

Mal-adjustment of Adj. 7 Fig. 3 is often the cause of back pressure on the clear keyboard key (key feels spongy as it is depressed). For this reason it is best to set the adjustment at a minimum (slight movement).

Condition the clear signal (take a total or pull the clear signal latching arm forward to its mid-position). As the clear keyboard key is depressed fully, the clear signal latching arm should have a slight movement forward. This pulls latch 1 away from the clear signal and prevents its relatching during clear keyboard, allowing it to remain conditioned as it was by the previous total.

The movement of the clear signal latch arm to insure that latch 1 will not be able to relatch the clear signal print arm (as clear keyboard key is fully depressed in home position after a total) should not be so excessive as to put back pressure on the clear keyboard key.

SUPPLEMENTARY ADJUSTMENT EXPLANATIONS

Adj. 8

The paper guide is perhaps one of the most difficult and critical adjustments to make on the machine. When it is mal-adjusted it results in excessive noise or poor paper spacing. For this reason, the paper quide should be removed with extreme care. When removing the paper guide always completely remove its retaining screws. This will prevent unnecessary forming of the paper guide.

The paper guide should, when correctly adjusted, curve around the platen with minimum clearance and not touch the platen at any point. This prevents any binding of the platen and allows the centralizer and detent gear to give the platen shaft their maximum detenting effect. Maximum detenting of the platen shaft will insure its positioning the platen correctly at the time of printing to insure good printing and proper spacing.

Any unnecessary restriction of the platen's rotation (caused by the paper guide for instance) could result in what might be called a "slingshot action". The tape feed pawl moves downward to advance the platen by cam action. A binding platen would at first resist movement by the feed pawl. The increasing force of the feed pawl would then rotate the platen so fast that it would tend to advance 2 1/2 teeth on double spacing, and in the next cycle, be centralized to a full triple space.

Besides the paper guide, the writing table being adjusted too close to the platen could be responsible for binding the platen. The ratchet gear could also be mal-adjusted to eliminate end play of the platen shaft and so restrict the platen rotation.

Another problem of tape feeding caused by the paper guide adjustment is poor paper tension. This condition is present when the platen is feeding and detenting correctly, but the paper does not fully keep up with the platen and results in very little or no spacing between the lines of print.

As previously stated, the paper guide must curve under and around the platen with minimum clearance. At the same time it must maintain clearance between its tines and the pressure roller, which puts tension on the paper to keep it moving with the platen. When the tines of the paper guide are too low and touching the ends of the pressure roller, they reduce the effect of the spring tension of the pressure roller against the platen.

Finally, if the top rear end of the paper guide is too low, it will be struck by the tails of the print wheel assemblies resulting in a tinny sound when printing.

To begin adjusting the paper guide, remove its two screws. (When checking the paper guide for proper clearance, hold the paper guide secure with the pressure of your fingers exactly as the screws will hold it.) First of all, move the rear of the paper guide up and down (just as the slots in the paper guide would permit adjustment) and check for a middle position where the rear of the paper guide has clearance to the print wheel tails and the front of the paper guide (directly under the platen) has clearance to the platen. (Do not be concerned about the tines at this point and form them out of the way if necessary). You may have to form the first offset at the rear of the paper guide to obtain this "middle position".

Next adjust the tines to curve around the platen with minimum clearance to the platen but not touching (the tines close to the platen insures that the paper will not buckle during printing and cause a fuzzy or sloppy print) and being careful to maintain clearance between the tines and the ends of the pressure roller. To adjust, remove the paper guide and form the tines in such a way that forming will take place only where it should.

Adj. 9

This adjustment is self explainatory.

Adj. 10

Depending on your particular model of machine, the print control bellcrank bumper either prevents the print control bellcrank from bottoming on the drive shaft sleeve next to the cam or prevents the print control arm from bottoming in the slots of the inner rear frames. In any event the printing mechanism should bottom on the bumper at the time of printing. (Some models have a felt lubricating washer next to the cam that will be contacted by the bellcrank even when the bumper setting is correct.)

The adjustment also calls for clearance between the tails of the print assemblies and the rear shaft of the print control arm when the print wheels are against the platen. This clearance insures that the print wheels will bottom only on the platen and make a good impression on the tape. If the bumper is to high, this safe clearance is destroyed.

Adj. 11

The print arm comb is adjusted per the instructions in the manual. If the comb is too far left or right, it will cause the print arm assembly to drag and result in a light print. Also the comb is formed carefully to the front or rear for minimum clearance to the print wheel aligners. If the comb is to close to the print wheel aligners, the print wheel assembly will drag, also resulting in a light print. If there is too much clearance between the comb and the print wheel aligner, the aligner will yield enough to allow a print wheel to turn and get out of time.

Adj. 12 Fig 1

The restore fingers are best adjusted with the keyboard removed, especially if individual fingers must be aligned. New restore fingers are almost always non-aligned and each finger must be aligned individually.

Adj. 12 Fig. 2

The bracket which holds the sector release link can be adjusted up or down and therefore determines how far the front of the link, that passes through the slot in the keyboard, will move downward before the rear end of the link is limited. Wrap a spring hook around the link itself and

pull downward. If the top front of the link will not come flush with the top of the keyboard bottom plate, it will restrict the full movement of the sector release rod directly above the keyboard and prevent escapement of the carriage could jam the zero latches into the bottom of the sector release link and cause damage.

Adjust the bracket so that the sector release link can be pulled down at least flush with the top of the bottom plate but not come out of the slot. Always check the link for freeness after adjusting.

Adj. 12 Fig. 3

The escapement comb adjustment is to be considered an extremely critical adjustment. It can and should be made as exacting as possible. Have the accumulator removed when checking this adjustment.

The comb should be adjusted to the right or left for 100% engagement of the setting levers to setting pins. This can be observed with the accumulator out and the machine upside down. Slowly depress the #1 selecting key until the setting lever comes next to the setting pin. Since the setting levers are stationary, the escapement comb must be adjusted to this requirement.

The manual states that 100% of the sector thickness should be engaged with the pendant gears when they are moved into the sectors. In most cases this will be the case when the setting levers have 100% engagement with the setting pins. If the sectors do not have good engagement with the pendant gears, the bottom row of pendant gears can be moved right or left by removing shims from one side and adding them to the other. The adjustment states that the escapement comb should be adjusted downward as far as possible. In some cases one end can go down farther than the other. This low side will have to be raised to make the escapement comb level. With the unit in home position, position the carriage so the angled lip of the escapement lever is directly over a tooth of the comb. Check the clearance between the tooth and the angled lip. Now move the carriage to the 9th position and again check the clearance. The clearance in both positions should be equal. Do not be concerned about the amount of clearance at this time.

Adj. 12 Fig. 4

First do adjustment Fig. 6, then return to adjustment Fig. 4. The illustration shows the zero key bottoming on the flat sides of a medium size allen wrench.

Adj. 12 Fig. 5 & 6

It is recommended that you remove the total key assembly for convenience and accuracy in making the following adjustments. This adjustment of the escapement lever stop limits the downward depression of all selecting keys. It effects the adjustments that concern pin set, sector release and carriage escapement so it should be set as accurately as possible.

As outlined in the adjustment, the escapement lever should be able to move

SUPPLEMENTARY ADJUSTMENT EXPLANATIONS

down only far enough to push the escapement pawl just below the comb teeth. To check that the pawl is moving down far enough, manually hold the carriage from moving to the left and depress a selection key. With the selection key held down, allow the carriage to move to the left slowly. If the comb tooth pushes the escapement pawl further down, then the escapement lever stop must be formed up.

To form the escapement lever stop, insert a T-bender through an access hole in the right side frame.

Adj. 12 Fig. 7

This adjustment is self explainatory.

Adj. 12 Fig. 8

The restoring springs for 1-8 selecting keys were removed and now depend on their setting levers to restore them fully upward. If the selecting keys are not fully restored their weight could hold the sector release rod downward and move the angled lip of the escapement lever toward the comb, possibly far enough to snag and interfere with carriage escapement or catch during carriage restore and lock up the machine.

Check each selecting key (especially 1-3) to see that it has no further free movement upward. See that its setting lever is bottoming on the back up plate (where its spring is attached) at the same time it fully restores its selecting key. The back up plate is adjusted forward until the selecting keys are fully restored upward.

If the back up plate for the setting levers is moved too far forward, it will move the setting levers away from the back up plate and increase the spring tension on the setting lever resulting in harder depression of the selecting keys.

Adj. 12 Figs. 9 thru 11

1. The normal sequence of (A) pin set, (B) sector release and (C) carriage hop should exist between the adjustments.

2. There should be a good delay between pin set and sector release as the key is pushed downward. This delay between pin set and sector release is necessary to prevent the sector from rotating to a nine when any of the #1 - #8 selection keys are depressed. Actually a "rapping touch" of the selection keys most often causes this condition to appear. This rapping motion on the keys will not move the key far enough down to set a pin, but through concussion gives enough momentum to the sector release link to release the zero latch. Lack of spring tension on the sector release link except for the light spring on the zero latch makes this possible.

   This condition of registering nines when the #1 - #8 selecting keys are "rapped" cannot be altogether eliminated, but the more delay or separation there is between pin set and sector release, the more improbable this condition is.

SUPPLEMENTARY ADJUSTMENT EXPLANATIONS

3. There should not be so much delay between pin set and carriage hop that it will allow a setting lever to hang up on the next restored setting pin to the right. Actually the carriage escapes as the selection key is restoring upward when the angled lip of the escapement lever comes out of the comb, but the later the escapement lever enters the comb to cause carriage hop, the earlier the angled lip will escape the carriage as the key is restoring upward.

In making the adjustments, accept the existing adjustment for pin set. It is in no way correct to lengthen or shorten a setting lever until adjustments Fig. 9 and 10 are made and are correct. Also, check the adjustments by the #8 selection key. It has the shortest setting lever and the shortest extension to actuate the sector release rod and therefore is more likely to be correctly aligned.

NOTE: If there is a sector delay arm to the machine, its operation should be disabled for these adjustments by loosening its pivot point.

Turn the eccentric for carriage escapement to delay carriage hop as long as possible without causing the carriage to hang up on a setting lever. To check, depress #8 selecting key and slowly allow the key to restore enough to raise the angled lip of the escapement lever above the comb and release the carriage. If the carriage does not escape to the next full position, advance carriage hop very slightly.

Next, adjust the sector release to occur just before carriage hop as the key is pushed downward.

The setting levers have been hardened to make it less likely for them to bend and become longer or shorter. It is generally advisable to stay clear of this adjustment if at all possible.

A short setting lever would tend to eliminate the good delay necessary between pin set and sector release and perhaps throw nines. This same condition could be caused by a sector release rod which was not parallel to the keyboard bottom plate or to the extension on key stem which actuates the sector release rod being formed downward causing early sector release and carriage escapement instead of late pin setting.

A long setting lever could cause the key to bottom on the setting pin instead of on the escapement lever stop (Adj. 12, Fig. 5). This condition causes the carriage to hand up on a setting lever as previously described or prevent carriage escapement altogether. This condition could also be caused by the sector release rod not being parallel to the bottom plate of the keyboard or to the extension of a selecting key being formed upward.

Before lengthening or shortening a setting lever to correct these conditions check that both the front and rear ends of the sector release rod are parallel to the bottom plate and that the extensions of the key stems which actuate the sector release rod (Especially 1-4-7 Keys) are not bent up or down.

Adj. 12 Fig. 12

When a released sector is holding the rear of the delay arm up, the escapement pawl should be just below the comb tooth in order to insure carriage escapement. If the escapement pawl goes below the comb with excessive clearance, it will cause the rear of the delay arm to be further down when the escapement pawl is up into a comb tooth, making it more difficult for the sector to raise the rear of the delay arm.

Adj. 13

The selection keyboard interlock is to be adjusted as high as possible maintaining a slight clearance to the interlock arm. This slight clearance insures that the restoring of the clutch throwout slide will not be restricted at this point. To check, release the clutch and half cycle the drive shaft. There should be a slight movement of the interlock arm before it limits on the interlock when a selecting key is depressed. This clearance must be kept to a minimum in order to prevent partial depression of a selection key while the drive shaft is rotating.

Even with the interlock properly adjusted, it is possible to rap sharply on the 1-9 selecting keys, and through concussion, position a setting lever which could break off a setting pin during carriage restore, or cause the sector release link to jump up in the path of the zero latches. The yieldable carriage restore arm tends to eliminate to some extent the breakage of these parts, but would still tend to weaken them. It is therefore not wise to rap on the selecting keys as the machine is cycling.

Adj. 14 Fig. 1

The bumper is to prevent the cam follower from contacting the rod and making noise. Too much clearance will restrict the carriage in the last position.

Adj. 14 Fig. 2

The carriage must restore far enough to the right to fully restore the first row of setting pins. When fully restored to the right, the carriage must have .005" - .010" clearance to the right side frame. This small clearance gives the carriage time enough to slow down so that it does not hit the right side frame with excessive speed and rebound so quickly that it escapes past home position before the escapement pawl can catch it.

Occasionally the eccentric on the carriage restore arm can not be adjusted for proper clearance of the carriage to the right side frame. It would probably be found in this case that the carriage restore arm has become twisted because of a lock up.

Adj. 14 Fig. 3

There should be as much clearance as possible between the overload arm and the eccentric without causing the carriage return hook to contact the stud on the cam follower shown in Fig. 1. If the stud is contacted there will be eccessive noise. In a repeat operation, the carriage return hook may not be able to reposition and carriage restore will not take place on the following operation.

Adj. 15 Fig. 1

The eccentric stud on the interlock operating link must allow enough clearance between the function interlock latch and the roller on the clutch release mechanism so once it is disabled it will reposition for the next operation. Too much clearance will not allow the interlock to get far enough out and will cause interference in selection.

Adj. 15 Fig. 2

The purpose of this mechanism is to provide faster operation so the operator can make selections while the drive shaft is still cycling. It is therefore necessary to get the interlock delatched as soon as possible. When adjusting, if the interlock is delatched before the lip is over the wide tooth on the comb, or, the baffle on the left side of the carriage is over the setting levers, the operator will be able to depress a selection key too soon. This will cause the carriage to be locked against the right side frame, or if the unit does escape, it will break either the setting pins or the zero latches.

Adj. 16

The left end of the pendant gear block could be bent upward or downward, forward or rearward. Set the adjustment so that the right end of the pendant gear block is correctly aligned and then, if necessary, form the left end to make it both level and parallel.

Adj. 17

This adjustment concerns a collar that limits the side play of the symbol links to prevent their disengagement, however, the same collar could very easily bind the restoring of these links if the collar is adjusted too close.

It is not pointed out in the manual, but the collar is on a shaft which itself is adjustable to the left or right. Just to the left of the collar for the symbol links is a bearing for the shaft on the left inner frame. The set screw in this bearing is tightened to prevent any end play of the shaft, but the shaft itself should be positioned so that a green clip on that shaft will limit the side play of the transfer control cam follower without binding.

Also, a little further to the left on the shaft is another collar which should be set to limit any end play of the drive shaft centralizing pawl without binding.

After adjusting the collar for the symbol linkage, check the links for free up and down movement.

Adj. 18 Fig. 1

The illustration shows the bails being operated by a screw driver. Because of backlash in the gears of the bails, it is important to actuate the bail for the plus transfer pawls by the screw driver and allow the rear bail to be actuated through the gears. This adjustment is critical in the sense that you will later adjust the cam action to overlatch the plus transfer pawls by a specific clearance. In order for the minus transfer pawls to have the same overlatch, Adjustment 18 Fig. 1 must be correct.

KEEP THE GEARS WELL GREASED.

Adj. 18 Fig. 2 & 3

On the newer style accumulators, the spacing for the accumulator detent gear shaft is not adjustable except by shims and for all practical purposes is most likely correct.

The accumulator height adjustment can be responsible for some very difficult and perplexing problems, so perhaps it should be kept in mind to check this adjustment in the event of unusual pressure when installing an accumulator.

Adj. 18 Fig. 4

The adjustment calls for .062" - .078" overlatch of the plus and minus transfer pawls to their transfer lever. Because the transfer pawl yields as it is overlatching a transfer lever, this clearance of .062" must be considered minimum reliable clearance for safe overlatch. The .078" maximum clearance prevents the transfer pawls from being bottomed in the accumulator which would put excessive back pressure on the roller for the transfer control cam follower.

Cycle the machine until the transfer control cam follower is on the high dwell. Use a .066" and .075" wire gauge (tool 18377 and 18378) to check the clearance between the transfer pawls and the transfer levers. The .066" gauge should pass through freely. The .075" gauge should be snug or not pass through at all.

Adj. 18 Fig. 5

The purpose of the bumper is to prevent the roller of the transfer control cam follower from bottoming in the low dwell of its cam. If the bumper is adjusted too high, not allowing the cam follower to go far enough into the low dwell, other problems will develop. The general nature of these problems would be caused by premature limiting of the transfer pawl on the transfer control bails when the transfer pawl moves in to turn the accumulator wheel, resulting in a transfer failure in that order or the orders to the left of it.

The transfer pawl normally moves inward to its stop, a shaft running through the center of the accumulator just below the accumulator wheels. This stop prevents the top part of the transfer pawl from yielding downward and therefore locks the accumulator wheel after it has been turned one tooth. If the bumper were adjusted too high, the transfer pawl could perhaps move downward enough to allow the accumulator wheel to move another tooth resulting in a double transfer.

When the bumper is adjusted properly it will keep the cam follower

roller from contacting the low dwell and yet allow the transfer control bails to move far enough inward so that the transfer pawl can limit on its stop. The illustration shows a released transfer pawl limiting on its stop and with safe clearance to the transfer control bail.

Adj. 19

The object of Adjustment 19 is to put as much drag on the pendant as possible without binding its movement. To much drag on the pendant would perhaps overcome the spring tension that tries to engage the pendant into the accumulator during an add cycle. Not enough drag might allow the pendant to osscillate back into the sectors on the 2nd half of a cycle, (Subtract-Total).

Tighten the damper. Next pull the add pendant manually into the sectors. Then let it slowly centralize. As it centralizes, it should move as smoothly as possible and completely centralize. Loosen the damper tension to obtain this action of the add pendant.

Adj. 20

To understand the requirements of this adjustment, it is necessary to recall how the total control bellcranks behave during a plus cycle. In home position, the bellcranks are held outward and disabled by the high dwell of the sub-total control cam. As the drive shaft rotates out of home position during a plus cycle (any cycle except total or sub-total) the bellcranks are allowed to move slightly inward until their movement is stopped by the sub-total control latch. In this position, clearance should be maintained between both bellcranks and the credit balance indicator. This clearance insures that the credit balance indicator will be able to change position during addition or subtraction and not catch on the total control bellcranks.

Note also that the illustration calls for clearance between the minus total control bellcrank and shaft A of the subtract pendant during a plus cycle when the bellcranks are limited by the latch. This, of course, insures that the rear total control bellcrank will not try to engage or even move the subtract pendant toward the accumulator in a plus cycle.

It goes without saying that the front total control bellcrank also should not try to engage the add pendant during a plus cycle, but this and other requirements of the front bellcrank are covered in Adj. 21 Fig. 5 which should be checked after this adjustment.

Furthermore, the bracket for the bellcranks should be adjusted during a plus cycle, when the bellcranks are limited by the latch, so that there is slightly less clearance between the rear total control bellcrank and the credit balance indicator than there is between the front control bellcrank and the indicator.

SUPPLEMENTARY ADJUSTMENT EXPLANATIONS

THE FOLLOWING PENDANT ALIGNER ADJUSTMENTS WILL REFER TO ONLY THE NEW STYLE CAM DRIVEN PENDANT ALIGNER.

Adj. 21 Fig. 1

The eccentric high point is shown in the manual to be forward. If the eccentric were rearward, this would give a greater up and down movement of the pendant aligner thereby advancing its operation in relation to pendant movement. (The pendant aligner coming up before the pendants are fully engaged with the accumulator.)

The illustration also shows a disengagement of one-sixteenth of an inch (.063", the .065" wire gauge can be used). This clearance not only represents good disengagement, but among other things determines how high the pendant aligner will rise to brace the pendants. Notice that one of the insets shows the flat side of the pendant aligner tip contacting a flat side of the pendant (not the beveled edge). This engagement is necessary to insure reliable bracing of the pendant.

To gauge the clearance correctly as shown in the illustration, the gauge would have to go between both tips of the add pendant and the tip of the pendant aligner at the same time. An easier method is to manually move the add pendant toward the sectors until the rear tip of the add pendant is directly over the pendant aligner and gauge this clearance with the .065" gauge.

Finally, observe the disengaged clearance between the subtract pendant and the pendant aligner. The clearance should be approximately the same as the add pendant clearance. If the curved right end of the pendant aligner bail becomes distorted (shorter or longer) the clearance of the pendant aligner to the add and subtract pendants will not agree. In this case, the pendant aligner bail should be replaced.

Many mis-operations of the machine, caused by poor pendant movement, tend to cause the pendant aligner to catch on the very tip of the pendants instead of rising. The cam action will then twist the bail. In this event the bail should be removed and straightened or replaced. The bail can be removed quite easily by moving its shaft to the right.

Adj. 21 Fig. 2

This adjustment is self explainatory.

Adj. 21 Fig. 3-4

When the add pendant is fully engaged with the accumulator, the lower shaft on the pendant is limited against the frames. The pendant aligner should have no clearance and no pressure when it is raised. This holds the pendant fully engaged with the accumulator for good reliable engagement of the gears and allows the pendant aligner to disengage quickly without dragging. This adjustment must be accurate for reliable pendant aligner operation.

SUPPLEMENTARY ADJUSTMENT EXPLANATIONS

Try the following on your machine: Do an add operation. Now, manually operating the add pendant, try to engage the pendant into the accumulator. It is blocked. Cycle the drive shaft by releasing only the clutch and then try to engage the add pendant into the accumulator. It can be engaged once and not again. Cycle the drive shaft again by releasing only the clutch. Next, manually hold the add pendant into mesh with the accumulator until it limits against the frames. With the other hand raise the pendant aligner below its eccentric and check for no pressure of the pendant aligner against the add pendant as you move the pendant aligner up and down. Hold the pendant aligner up, engaged with the pendant, and slowly release the add pendant. There should be no movement of the add pendant away from the accumulator if the no clearance requirement is correct.

Adj. 21 Fig. 5

This adjustment concerns the position of the front total control bellcrank at two different times.

In home position, the front total control bellcrank is held disabled by the subtotal control cam. In this respect, the adjustment specifies that the bellcrank should have sufficient clearance to the sectors to allow carriage escapement.

Secondly, during an add cycle (or any cycle other than total or sub-total) as the drive shaft is rotated out of home position, the high dwell of the subtotal control cam moves away from its cam follower allowing the bellcrank to move slightly rearward until it is stopped by the sub-total control latch. At this time the front total control bellcrank should not interfere with the add pendant engagement to the sectors during an add cycle. In fact the manual shows a .005" to .020" clearance between the bellcrank and the lower shaft to the add pendant when the bellcrank is limited by the subtotal control latch and the add pendant is engaged with the sectors.

The bellcrank is formed to the front or rear to meet these two requirements. If the bellcrank is formed to the rear, check to see also that the credit balance indicator has clearance to the bellcrank when that bellcrank's rearward movement is limited by the sub-total control latch during an add cycle as outlined.

Adj. 21 Fig. 6

The subtract pendant is moved into mesh with the accumulator by spring tension against the pendant operating cam follower. This spring is often not strong enough to fully mesh the pendant and accumulator gears so the aligner is set to hold the pendant into full engagement. The aligner must not be set too tight as it will drag on the pendant and be slow, or fail to release. Check by cycling the machine in minus until the subtract pendant moves into mesh with the accumulator but the aligner has not yet moved up. Manually raise the aligner to see that it properly positions the subtract pendant and yet is free to move down when released.

SUPPLEMENTARY ADJUSTMENT EXPLANATIONS

Adj. 22

The plus key should be relatively level with the other keys, but the ease of depressing the key is just as important. Check for the clearance specified in the adjustment and check for an easy depression of the key by pushing down on the rear half of the key top.

Adj. 23

Install the motor and make this adjustment after completing all the other adjustments.

Keep in mind that the drive shaft speed of the adding machine is critical because of the necessary sequence of operation that must be maintained between cam operation and spring operation.

Adj. 24

This adjustment was put in the machine to eliminate the noise of the drive gears. If the gears are not noisy, disregard this adjustment. If the gears are noisy, it may be possible to reduce the noise by rotating the eccentric as shown in the adjustment.

If a machine does not have these parts, it is possible to install them. It will be necessary to drill the frame or replace it.

Adj. 25

The design of the machine allows various parts to be positioned correctly by the different operating keys only if they (the keys) are held fully bottomed during the drive shaft cycle. The keys are held fully bottomed by the clutch throwout slide being pushed forward by the periphery of the clutch. It is possible to adjust the clutch throwout slide so that it will bottom the key fully and then try to move further forward and apply undesirable back pressure on various parts of the clutch mechanism. This back pressure is undesirable in the sense that it will in time cause the roller following the clutch to wear flat. Most frequently, damage occurrs to the many parts which are pinned to the clutch throwout fork shaft (at front of machine) by causing these parts to break loose from their hubs.

In general, the operating keys should be held fully bottomed without any back pressure when the drive shaft is half-cycled.

Before attempting to make the clutch adjustments for any group of keys, depress the key and back up the drive shaft to check each key for sponginess or back pressure. This would be caused by parts, which the key is trying to position, limiting prematurely. Any sponginess of the key to begin with could interfer with correct clutch adjustments.

There are three different points of adjustment for obtaining clutch releasing.

SUPPLEMENTARY ADJUSTMENT EXPLANATIONS

Adj. 25 Fig. 1

The first point of adjustment is on the clutch throwout slide near the clutch holding pawl and is for the minus and print only keys alone.

To check the adjustment, depress the minus key. Very slowly rotate the handcrank until you can feel that the key is fully bottomed. If the key does not bottom, the adjustment is wrong. Rotate the drive shaft further. If the clutch throwout slide tries to move further forward, even though the key is already bottomed, it is doing so under pressure. You would then have to remake the adjustment to relieve the pressure but still keep the key fully bottomed.

There should be clearance between the print only key and the clutch throwout slide when the print only key is restored and the clutch throwout slide is moved past it. This clearance is affected by the preceding clutch releasing adjustment. For convenience in maintaining this clearance, the .010" gauge could be placed between the roller on the print only key and the clutch throwout slide while setting the clutch throwout slide to the minus key.

Adj. 25 Fig. 2

This adjustment concerns a bumper for the front of the clutch throwout slide that was added to the machine to prevent double cycling of the drive shaft. Without the bumper the clutch throwout slide, which is restored to the rear by spring tension, would normally bottom on the clutch dog or the periphery of the clutch. At the end of an add cycle (or any cycle) as the clutch throwout slide restored, it would bottom at either of these two points, which were still rotating at this time, and be pushed forward again for another cycle, with no operating key down. This second cycle would print all 9s on tape. The bumper allows the clutch throwout slide to restore and rest against a stationary part rather than on the rotating clutch. Incidentally, early clutch releasing could cause this same condition of PRINTING 9s.

Adj. 25 Fig. 3

In order to get good clutch releasing on total, sub-total and plus make this adjustment as shown in the book. Be sure the total key is not binding and is fully depressed. Check the sub-total and plus keys by depressing them slowly to see if the clutch release. If the key has an obstruction preventing the clutch from releasing, find the obstruction and remove it. Do not reduce the clutch adjustments to get around it.

Adj. 25 Fig. 4

Adjusting for clutch releasing from the left side of the machine is important to a repeat operation. It may be better to adjust to the repeat add key rather than the clear keyboard key as stated in the manual. Be sure the key has no obstructions before making the adjustment. Check the clear keyboard key.

Adj. 25 Fig. 5

The main purpose of this adjustment is to prevent any obstruction to the movement of the keylatch lever. The keylatch lever moves the clutch dog latch to release the clutch and allow the drive shaft to rotate. The keylatch lever must work freely in order to get easy, proper clutch releasing. Loosening screw B only allows the adjustment to be made without destroying other clutch adjustments.

Adj. 25 Fig. 6

This adjustment concerns termination of the drive shaft cycle. It prevents another cycle of the drive shaft from taking place until the operating key is released and re-depressed. The eccentric should be adjusted so the keylatch live tip is raised as high as possible without contacting the upper stud on the keyslide pivot link. If the upper stud were contacted, the force from the cam follower could cause the keylatch live tip to contact the lower stud on the keyslide pivot link and slip by, causing another clutch release. This would also cause wear on the roller of the switch link restore cam and create noise.

Adj. 25 Fig. 7

This adjustment is self explainatory in the manual.

Adj. 26 Fig. 1

Make this adjustment when the motor is installed after all of the adjustments are made. The micro switch must close before the clutch is released to allow the motor to reach its speed before a load is applied.

When checking this adjustment, make certain that the motor will shut off reliably, otherwise the motor could burn up and its burning insulation would gum up the entire machine.

Adj. 26 Fig. 2

Without the auxiliary switch lever, at the end of any operation, should the drive shaft fail to go all the way home, the roller on the switch link restore cam would be holding the cam follower to the rear. This would be holding the keylatch live tip up so that if an operating key were depressed, the key would restore and no operation would take place.

If the motor hadn't been shut off it would have driven the drive shaft to home position. The purpose of the auxiliary switch lever is to hold the micro switch operated until the cam follower drops off the high point of the cam insuring that it will be in home position. Be sure the adjustment allows the micro switch to open in home position.

Adj. 27 Fig. 1 & 2

The eccentric for this adjustment passes through the control links and not the cam follower. Make certain that the rear of the links are up rather than down in relation to the head of the screw. The eccentric being up will insure the pendant movement is not delayed in relation to pendant aligner operation.

The adjustment of the eccentric to the front or rear must meet other requirements. For instance, if the adjustment was set correctly and through operation of the machine, the add pendant was bent to the rear, the equal clearance to the control links would be destroyed. We might be tempted to adjust the eccentric to give us this equal clearance to the lip on the add pendant, but that would move the pendant control link subtract extension further away from the subtract pendant and perhaps result in poor subtract pendant engagement with the accumulator during a subtract entry.

If the lip on the add pendant were bent forward and the eccentric were adjusted for equal clearance it would move the single-sided lever forward toward the subtract pendant and perhaps allow the subtract pendant to be kicked into the accumulator during an add cycle resulting in a lock up, or a print only operation resulting in a subtract entry.

To correctly make the adjustments, first check carefully to see that the lip on the add pendant is relatively straight. With the add key fully depressed and the drive shaft in home position, adjust the eccentric (high point up) to obtain equal clearance as shown in the adjustment.

Next, hold the subtract key fully depressed with the drive shaft in home position. Check to see that the pendant control link subtract extension is not touching the subtract pendant with pressure or trying to hold it partially engaged with the accumulator. Actually, it should come right up next to the subtract pendant without pressure.

When adjusting the eccentric, relieve the pressure of its lock washer.

Adj. 27 Fig. 3, 4, & 5 (AB Type Machines)

Before making the adjustment, Fig. 3, turn the eccentric stop shown in Fig. 5 so it will not limit the add control bellcrank. With the stop backed off, depress the add key. The add pendant control link should position with a minimum clearance to the underside of the lip on the add pendant. Any excessive clearance could allow disengagement of the link from the lip on the add pendant during operation. Too little clearance would cause back pressure on the add key and prevent restoring of the parts. To adjust, form the add control slide link as illustrated.

Next, set the eccentric on the bottom of the add control bellcrank to meet the same conditions when the repeat add and clear keyboard key are held depressed. The minus key and print only key operate the subtract pendant control link. It should be adjusted to the same conditions as the add pendant control link.

After the above adjustments are completed, hold the add key depressed and adjust the eccentric stop (Fig. 5) to just contact the bellcrank. Any pressure on the stop could cause the add key, repeat add key or clear keyboard key to feel spongy and not properly set the add pendant control link.

SUPPLEMENTARY ADJUSTMENT EXPLANATIONS

Adj. 28

This adjustment is to allow the add key to move freely into the interlock. The interlock must move freely when the add key is in home position. If it is binding, it may be caused by the shaft in the frames. In some instances, tightening the screws that hold the frame for the total and sub-total keys will relieve the bind.

Adj. 29

Check the symbol bail before proceding with this adjustment. Look at the right and left end of the bail from the right side of the machine. The right end should be close to level with the left end (parallel to base plate). If the right or left end seems to be higher, the bail is twisted. Straighten with the proper tools before proceeding.

The illustration shows the minus-print only symbol actuator stop resting against a stud when the machine is in home position. Pull the total and sub-total actuator stops out of the way to check. The restored position of the actuator stop insures that it will not limit the symbol actuator prematurely during total or sub-total. It also insures that the holding pawl will stay fully bottomed into the symbol actuator to restrict its movement during an add cycle.

If the actuator stop is not up against its stud or close to it, the entire linkage is probably being held partially positioned by the print only block or subtract character control or both. In this event you would have to readjust the eccentric studs at the bottom of the minus and print only keys. This will move the print only block and subtract character control away from the stud and allow the symbol linkage and actuator stop to restore. The print only block and subtract character control should contact the stud as stated in the manual, but not hold it rearward. If they have excessive clearance to the stud it will reduce the travel of the actuator stop preventing good engagement and also not fully disengage the holding pawl during a subtraction.

The eccentrics on the subtract and print only keys should be turned towards the rear of the machine.

Adj. 30

As the print only key is depressed, the rear "foot" of the print only block should position in front of the eccentric stud on the pendant operating cam follower with minimum clearance. The minimum clearance insures that the pendant operating cam follower will not drop into the low dwell of the pendant operating cam and try to engage or even kick the subtract pendant toward the accumulator.

Secondly, the print only block must restore at the end of the cycle by spring tension, and so there should be no drag of the block on the eccentric stud.

The manual points out that it might be necessary to form the lip at the rear of the print only block to prevent any drag of the block as it positions or restores.

SUPPLEMENTARY ADJUSTMENT EXPLANATIONS

Adj. 31

The illustration in the manual shows the front total linkage being held fully restored by finger pressure while the rear total linkage is being held fully restored by holding the stud on the total bail upward. Note that the actuator stop is limited upward against the stud on the frame. The screws are loose at the time to obtain this full restoring of both front and rear linkages and then tightened to hold the adjustment.

With the actuator stop fully limited against the limiting stud, the maximum disengagement of the actuator stop is insured. For reliable disengagement of the total actuator stop, it should always be fully restored. The full restoring of the front total linkage (touching the shaft) insures maximum downward movement of the actuator stop when the total key is fully depressed. This is necessary to meet the requirement of correct positioning of the upper stop for a positive total symbol as shown in the inset (a minimum bite of 50% and up to 100% if possible).

Even when the adjustment is made accurately, the actuator stop may not move far enough downward during a plus total (Credit balance indicator in plus position) for the minimum bite of 50% as shown in the inset. In this case check for three other conditions.

First of all check the clutch adjustment for the total key (fully bottomed with drive shaft rotated).

Secondly the eccentric stud on the minus control bellcrank could be pushing the rear link backward even though the rear bellcrank is limited by the credit balance indicator (plus total). If so, back the eccentric stud away and recheck for 50% minimum bite.

Finally if the 50% minimum bite still can not be attained, you will probably find that the bail at the beginning of the total linkage has become twisted away from the actuating stud on the total key and not allowing the depression of the total key to give the linkage its full movement for good engagement of the actuator stop. In this case, align the bail.

Adj. 32

The requirements for the adjustment of the sub-total linkage are the same as outlined in Adj. 31 for the total linkage.

Adj. 33

Make a note in your manual that the eccentric stud should be down.

The adjustment should be made as outlined in the manual. The eccentric stud on the rear total control bellcrank should come up to the closest link with no pressure no clearance when the drive shaft is half cycled during a positive total or sub-total.

To get a good view of this adjustment, remove the base plate screw directly to the right of the eccentric stud.

SUPPLEMENTARY ADJUSTMENT EXPLANATIONS

This setting (no pressure) insures that the actuator stop will not be moved back up and decrease the critical 50% bite on the upper step of the actuator stop during a positive total. No clearance insures that the actuator stop will be backed up properly for good engagement to the lower step of the actuator stop during a minus total.

Adj. 34 Fig. 1

As an incidental note, if the ribbon spool brackets are attached to the inside rather than the outside of their frames, the range of Adjustment 34 Fig. 1 & 2 will be destroyed.

The adjustment seems simple enough. Adjust the movement of the left feed pawl, by the eccentric, so that the left ribbon ratchet is turned 2 1/2 tooth spaces. This adjustment for the feed pawl should meet another requirement to insure reliable ribbon reversing.

After the eccentric is set for proper feeding of the ratchet by the feed pawl, turn the ribbon ratchet until it is against its holding pawl in home position. In this position, check that the feed pawl has overlatch but minimum clearance to the proper ratchet tooth. This clearance insures that the movement of the feed pawl and link (see illustration) will be limited enough to allow the stud of the ribbon drive arm to slip into the rear notch of right feed when the rotation of the right ribbon spool is restricted (ribbon completely unwound.)

Adj. 34 Fig. 2

Adjustment 34 Fig. 2 should be made and checked only after adjustment Fig. 1 is correct. Fig. 2 should meet the same requirements as the left ribbon feed Fig. 1. Also after right ribbon feed is adjusted, check for proper disabling of the left ratchet holding pawl during right ribbon feed and vice-versa.

Adj. 35 Fig. 1 & 2

When the ribbon lift mechanism is properly adjusted, printing will be all black on the positive operation, and all red on the negative operation. When the home position adjustment is made, it is important not to limit the ribbon supports on the studs. This condition could cause wrong answers by putting a twist in the actuator drive shaft. The screw (Fig. 2) that limits the movement of the ribbon supports must be properly positioned to prevent obstructions that could cause wrong answers.

Adj. 36 Fig. 1

With the platen assembly out of the machine, fully depress the clear keyboard key and hold. Loosen the allen screws on the paper feed blocking arm and move it so it will just contact the stud on the paper feed cam follower as shown in Fig. 1. If the key is not held fully depressed and obstruction will be caused by the blocking arm and will prevent the keyboard clear operation.

SUPPLEMENTARY ADJUSTMENT EXPLANATIONS

Adj. 36 Fig. 2

After making this adjustment, Adj. 3, Fig. 7 disabling of the clear signal latch, should be checked. Be sure there are no obstructions or printing during a clear keyboard may occur.

Adj. 37

The guide retainer for the total slide should not be so tight that it prevents restoring of the total and sub-total slides by spring tension. If the retainer is too loose, up and down play at the rear of the slides will be excessive and prevent proper delatching of the sub-total control latch from the sub-total cam follower. The lip of the subtotal control latch might momentarily snag the subtotal cam follower and delay pendant engagement into the accumulator long enough for the pendant aligner to interfere with its engagement.

After the guide retainer is correctly adjusted, the slide is then adjusted with the total key held fully depressed for proper delatching of the subtotal control latch and proper positioning of the total operating latch. This adjustment must be made without bottoming or binding the parts. Bottoming these parts, total slide, sub total control latch or total operating latch will result in a "spongy" total key and perhaps prevent the total key from restoring at the end of a total operation.

Adj. 38

The operating bail is adjusted by the eccentric on the subtract key. There is to be no lost motion in the operation of the bail, but the bail must not hold the subtract key from fully restoring. After adjusting to the bail, the eccentric must not be rotated to adjust the subtract character control bellcrank as it will destroy the bail adjustment. The subtract character control bellcrank must be formed to meet the conditions outlined in the adjustment.

Adj. 39

There are two different styles of subtract character control bellcranks. The one shown in the illustration is the old style which required a very close adjustment (a maximum clearance of .005") between the subtract character control and the ribbon control when the machine is in home position. When the subtract key is held fully depressed the point of latch 1 will be well above the lip on the add pendant. The manual states clearly the misoperation that could result if latch 1 did not position properly. If the subtract character control has too little clearance to the ribbon control latch, it would be trying to delatch latch 2 when the machine is in home position.

If the subtract character control on your machine is different from the one shown in the manual (the newer style has an extra form to the rear of its pivot point), the adjustment is not as critical as the old style. Like the early style, the revised subtract character control should not hold the ribbon control rotated or slightly positioned with the minus key restored. It is not necessary to maintain a maximum clearance between these parts of .005" but check for excessive clearance between the two parts by fully depressing the subtract key and seeing that the point of latch 1 rises above the lip of the add pendant.

SUPPLEMENTARY ADJUSTMENT EXPLANATIONS

Adj. 40

The object of this adjustment is to have free movement of the bails and still have the zero latches blocked to prevent latching of the sectors on a repeat or back space operation. It is not necessary for the bail to have equal clearance but it must move freely and block properly. Before forming, and taking a chance of breaking the lip, check to be sure that it is necessary.

Adj. 41

After the clutch adjustment (Adj. 25) has been properly made, Adjustment 41 for repeat subtract should be made. When adjusting, have the repeat subtract key held as close to fully depressed as possible without being held bottomed. If the key is held too tightly bottomed, when released at the end of the operation, it may not return far enough to allow the clutch restore cam follower to pick up the stud on the clutch dog latch. If the key is not held depressed enough, the carriage return hook màỳ pick up when the key is released, causing the carriage to restore home without latching up the sectors. Also, the optional carriage will not function properly.

Adj. 42

This adjustment is self explainatory.

Adj. 43

In order to prevent a carriage return after a repeat operation, it is necessary to adjust the carriage return hook to the left as far as possible without chocking off key depression.

Adj. 44

This adjustment concerns the front and rear eccentric studs on the actuating lever and should be made only after clutch adjustments are correct (adj. 25). The general requirement for the adjustment of the front eccentric stud is to have the clutch release first as the repeat add or repeat subtract key is depressed. Just after clutch releasing, further depression of the key should cause carriage HOP (escapement pawl pushed below escapement comb. If carriage hop occured before clutch releasing, then the carriage could escape without releasing the clutch causing errors in multiplication.

The requirement for adjusting the rear stud is to allow the repeat add key to obtain the same clutch releasing and then carriage hop when the front eccentric stud is set to the repeat subtract key.

Adj. 45

The optional setting lever stop is an interlock that prevents disengagement of the optional escapement lever (angled lip) from the escapement comb during a cycle. It is adjusted to have clearance to the actuating lever in both positions of the shift key. This prevents any back pressure when repeat add or subtract keys are depressed.

Adj. 46

This adjustment is self explanatory.

FRIDEN ADDING MACHINE

TROUBLE SHOOTING

PREFACE

The adding machine troubles and corrections on the following pages are offered only as suggestions. This list is not intended to be all inclusive, only common troubles and the usual remedies have been listed. Many of the corrections apply only to older "AB" type machines, since the parts listed as a correction are included in later machines.

The best trouble shooting guide is a thorough knowledge of the machine, since this will enable the serviceman to quickly locate the portion of the machine cycle and the parts causing the trouble, at which point the correction required will usually be obvious.

TROUBLE SHOOTING

INCORRECT TOTAL
(UNDERCOUNT ON ALL PLUS OR MINUS LISTINGS)

REFERENCE-OPERATION AND ADJ. MANUAL
PARTS MANUAL

1. #2 Transfer pawl or minus transfer pawl, dragging an accumulator gear when restoring, thus cancelling the transfer.

   A. Check for binding pawl at the rivet or between the frames of the accumulator.
   B. Detent not holding properly, replace spring, see parts manual.

2. Minus transfer pawl or #2 plus transfer pawl, slipping off the gear after a transfer allowing the gear to rotate an extra tooth. An extra turn on the minus side will cause an undercount on a plus total. An extra turn on the plus side will cause an undercount on a minus total.

   A. Check for a wobbly accumulator gear.
   B. Check for bent accumulator frames or loose cam on gear.

3. Detent gear missing an accumulator gear.

   A. Check for side play in gear.

4. Actuators slipping off the pendants.

   A. Check Adj. 1, Figs. 1, 2, 3 shim the earlier styled subtract pendant.
   B. Check Adj. 1, Figs. 1, 2, 3 for side play in the actuators.

5. Accumulator gear not turning far enough to position the transfer point, past the plus transfer lever.

   A. Check Adj. 3.
   B. Check for a twisted actuator drive shaft.

6. Bouncing pendant.

   A. Check Adj. 19

7. Detent bail for detent, twisted at the left end.

   A. Align.

8. Transfer pawls backing up during restore. If on the plus side, a minus total will give an undercount. If on the minus side a plus total will give an undercount.

   A. Install drive shaft anti-back up pawl type 1 or 2 as required. See AB/ABY Parts Manual, SP - 12.
   B. Install new carriage return cam.

9. Add pendant failing to engage the accumulator.

   A. Check Adjs. 5 & 21, Fig. 1.
   B. Install override arm 250295-S type 1 or 2 as required. See AB/ABY Parts Manual, SP-16.

10. Add pendant failing to engage the accumulator (After a plus total)

   A. Check for binding 240130-operating lever assembly blocking bail.

11. Worn roller on transfer control bellcrank assembly.

   A. Replace
   B. Check cam.

12. Subtract pendant fails to engage the accumulator.

   A. Check Adj. 5, Adj. 21 Figs. 1 & 6, Adjs. 30 & 39.
   B. Change spring on pendant operating cam follower

13. Sluggish or binding sectors.

   A. Flush out with solvent.

14. Binding actuators or gear train.

   A. Free up.

15. Bouncing subtract pendant.

   A. Replace spring on the subtract pendant.

16. Add pendant failing to engage the accumulator (After a minus cycle).

   A. Check for bind.

INCORRECT TOTAL
(OVERCOUNT ON ALL PLUS LISTINGS)
REFERENCE-OPERATION AND ADJ. MANUAL
PARTS MANUAL

1. Transfer pawls not latching or remaining latched on release levers.

   A. Check Adj. 18 Figs. 1 & 4.
   B. Check for worn roller on transfer control link and bellcrank assembly.

2. Transfer pawls slipping off sideways.

   A. Check alignment of pawls to release levers.

3. Transfer pawls binding at rivets or between the accumulator frames during restore.

   A. Unhook springs and manually test the pawls for freeness and alignment.

4. Latching surface of transfer pawls too round allowing pawl to slip forward off the release levers. (on earlier machines.

   A. Stone latching surface flat, also tap the release lever lip slightly toward the center of the accumulator.

5. Actuators slipping off the pendant gears because of side play in the actuators.

   A. Check Adj. 1 Figs. 1, 2, 3.

6. Backup pawls not holding the actuators properly.

   A. Check the alignment of the backup pawls and the actuators.
   B. Check for loose or worn roller on the backup pawls.

7. Side play in the backup pawl bail and shaft.

   A. Remove play by shimming on the earlier machines. On the later machines check Adj. 1 Figs. 1, 2, 3.

8. The add pendant not held properly.

   A. Check Adj. 5 & Adj. 21.

9. Transfer pawl slipping off the accumulator gear after the transfer, allowing the gear to rotate.

   A. Align the transfer pawl.

10. Wobble in the accumulator gear.

    A. Replace the gear.

11. Accumulator frames spread.

    A. Replace the accumulator.

12. Transfer pawls backing up during a restore.

    A. Install drive shaft anti-backup pawl, type 1 or 2 as required. See AB/ABY Parts Manual, SP-12.

13. Accumulator not clearing out on a previous total.

    A. Check for binds in the gear train and also for foreign material.

INCORRECT TOTAL
(OVERCOUNT ON ALL MINUS LISTINGS)
REFERENCE-OPERATION AND ADJ. MANUAL

1. Minus transfer pawls, not latching or remaining latched on the release lever.

    A. Check Adj. 18 Figs. 1 & 4.
    B. Check for worn roller on transfer control bellcrank assembly.

2. Transfer pawls slipping off sideways.

    A. Check alignment of the pawls to the release levers.

3. Transfer pawls binding at the rivets or between the accumulator frames during restore.

    A. Unhook springs and manually test the pawls for freeness and alignment.

4. Subtract pendant not engaging the accumulator because the tail on the add pendant control link is not moving the pendant.

    A. Check Adj. 21 Fig. 6, Adj. 30, Adj. 39, install new spring.

5. Add pendant control link, binding in its guide, restricting the subtract pendant from engaging the accumulator.

    A. Align subtract pendant control link.

6. Actuator slipping off the subtract pendant gears because of side play in the actuators.

    A. Remove play. See Adj. 1 Fig. 1, 2, 3.

→ 7. Check for missing extrusion on minus transfer release lever live-point.

REPEAT ADD

1. Carriage fails to shift with the optional shift lever on mult.

    A. Check Adj. 44.

2. Carriage restoring repeat add operation.

    A. Check Adj. 43.

3. Sectors clear out on repeat add operation.

    A. Check Adj. 40.
    B. Check for binding repeat bail.

MOTOR

1. Motor runs erratically or fails to run.

    A. Check for sticking or burnt motor or governor brushes.
    B. Check the points of the governor.
    C. Check for burnt out condensor.
    D. Check for faulty micro switch.
    E. Check Adjs. 23 & 26.
    F. Check for loose or broken cord.
    G. Drive shaft stopping out of home Adj. 26 Fig. 2.

SYMBOLS

1. Wrong symbol.

    A. Check Adjs. 17, 20, 29, 31, 32, 33, 38.
    B. Check for binding linkage.

2. No symbol.

    A. Check for binding linkage.

3. Continuous clear signal.

    A. Check Adj. 7, Fig. 1.

4. Clear signal on clear keyboard operation.

   A. Check Adj. 7, Fig. 3.

BACK SPACE

1. Carriage back spaces more than one space.

   A. Check Adj. 46.
   B. See Parts Manual for new and revised parts.

2. Carriage fails to backspace.

   A. Check Adj. 46.
   B. Check spring for being off the backspace pawl.

3. Carriage restores on a backspace operation.

   A. Check Adj. 43.

REPEAT SUBTRACT

1. Carriage fails to shift with optional shift lever on "Mult".

   A. Check Adj. 44.

2. Carriage restores on repeat operation.

   A. Check Adj. 43.

3. Sectors clear out on repeat operation.

   A. Check Adj. 40.
   B. Check for binding repeat bails.

CLUTCH

1. Clutch bouncing open at the end of a cycle.

   A. See AB/ABY Parts Manual, SP-15, for new clutch.

2. Clutch difficult to open.

   A. Check Adj. 25.

CLEAR KEYBOARD

1. Binding key.

   A. Check for worn roller on print control bellcrank.
   B. Spring on over load arm.
   C. Bind in carriage control shaft.

KEYBOARD

1. Wrong selection.

   A. Check Adj. 12, Fig. 9.
   B. Check for sluggish selection levers (solid color). Flush with solvent. See Parts Manual for new nickle plated selection levers.
   C. Check for broken zero latch.
   D. Check sector delay.
   E. Check zero latches.

LOCK UPS

1. Both pendants engaged.

   A. Check for binding pendants.
   B. Check for bouncing pendants. Check Adj. 19.
   C. Check for flat roller on the clutch dog.
   D. Check for too wide clearance between ribbon control latch and subtract character control bellcrank of Adj. 39. See Parts Manual.
   E. Check clutch adjustments for being too wide. Adj. 25.
   F. Check Adjs. 20 & 33.
   G. See Parts Manual for pendant dampener.

2. Holding pawl jammed in the carriage comb.

   A. Replace interlock, if soft, with hardened part. See Parts Manual.

3. Carriage caught on the segment release link.

   A. Check for binding or sluggish segment release link.
   B. Install new segment release link and spring. See Parts Manual.
   C. Check timing, Adj. 12.

4. Add pendant caught in the carriage as the carriage restores. (Print only operation)

   A. Check Adj. 21 and 30.

NOISE

1. Motor

   A. Align motor, Adj. 23.

2. Gears.

   A. Replace loose or warped nylon gears.
   B. Align gears, Adj. 24.

3. Vibrating springs.

   A. Install plastic noise eliminators.

PRINTING

1. Printing an 8 when a 9 is selected, a 7 when a 8 is selected, etc.

   A. Install the new sector delay mechanism. See Parts AB/ABY Manual, SP-17.
   B. Broken or stuck rebound slug or sector.

2. Platen spaces erratically.

   A. Replace space control lever spring.

3. Poor print.

   A. Check Adjs. 9, 10 & 11.
   B. See Parts Manual for new cam and print control cam follower.

4. Binding print wheels (rotating).

   A. Check Adjs. 4 & 6.
   B. Check gear train for binds.

5. Binding print levers.

   A. Check Adj. 11.

6. Red commas with black figures.

   A. Check Adj. 35.

7. Print wheels out of time.

   A. Check width of the shroud of the print wheels.
   B. Check Adj. 11.
   C. Form zero foils to the left to act as a guide.
   D. See AB/ABY Parts Manual, SP-18, for new print wheels and idler gear and block drum assembly.

8. Fail to print.

   A. Check Adjs. 5, 10 & 21, Fig. 1.
   B. Broken springs on the print wheel assembly.
   C. Pendant aligner disengaged from its guide stud.
   D. Check for broken cam followers.

9. Ribbon fails to reverse.

   A. Check Adj. 34 Figs. 1 & 2.
   B. Check for binding linkage and missing springs on the ribbon reverse mechanism.
   C. Install new spring on ribbon reverse link. See Parts Manual.
   D. Increase the ribbon drive pawl spring tension.

10. Partial red and black print.

    A. Ribbon slack. Increase tension on the holding pawl springs.
    B. Excessive clearance between ribbon control latch and the ribbon support. Adj. 35.
    C. Ribbon not in supports.
    D. Supports hitting the top cover.

11. Red print in place of black.

    A. Ribbon control is not restoring after being actuated by minus, negative total, or sub-total. Check for bind.
    B. Check alignment of latch 2.
    C. Ribbon control catching lip of the add pendant.

12. Lower part of figures not printing in red.

    A. Ribbon slack after reversing occurs. Increase tension of ribbon spool springs.
    B. Ribbon supports too high. Check Adj. 35.

13. Black print in place of red.

    A. Latch 2 not disengaged from ribbon control.
    B. Check subtract pendant for freeness and proper operation.

14. Poor print caused by the speeding up of the drive shaft.

    A. Install rebound block type 1 or 2 as required. See AB/ABY Parts Manual, SP-16.
    B. See Parts Manual for new carriage return cam.

CARRIAGE

1. Carriage bouncing out of home position after a restore operation.

   A. Check for worn tooth in the carriage comb. See Parts Manual for new comb.
   B. Install sector delay mechanism. See AB/ABY Parts Manual, SP-17.
   C. Check Adj. 14, Fig. 2 & see Parts Manual for new escapement pawl.

2. Sluggish carriage sectors.

   A. Flush sectors with solvent.
   B. See AB/ABY Parts Manual SP-15 for new type sector.

3. Sector caught on sector release link.

   A. Check Adj. 12, Fig. 2.
   B. See AB/ABY Parts Manual, SP-10 for revised sector release link assembly.

4. Sluggish carriage.

   A. Check carriage for binding on the lower shaft, nylon bearings of the upper shaft and the restore fingers. See AB/ABY Parts Manual, SP-20 for new bearing.

5. Carriage fails to escape.

   A. Check for broken or ruptured spring on pivot bracket.
   B. Check for sluggish or bent selection levers.
   C. Check for notch worn in holding or escapement pawls.

6. Sectors fail to restore to zero.

   A. Check Adjs. 5, 6, 21 (Fig. 1), & 25.
   B. Flush out add pendant gear trains with solvent if sticky or sluggish. Also clean the print wheels.
   C. Check the spring on the yieldable latch of the actuators for being weak or broken.
   D. Check for loose or broken roller or rivets.
   E. Check for rough latching surface on zero latch.

7. Carriage fails to restore far enough to the right.

   A. Check carriage restore arm for being bent. See AB/ABY Parts Manual, SP-21, for new yieldable carriage restore arm assembly.

1. Printing all 9's on a total or sub-total without a signal.

   A. Pendants not engaged. Check Adj. 21.

2. Printing all 9's on a total with a compliment figure.

   A. Check for binding credit balance indicator.
   B. Check for credit balance indicator hitting 260040 or 260045. Form 260045 on the earlier machines. See Parts Manual for adjustable bracket 260075 on the later machines.
   C. Check for accumulator wheel contacting the credit balance indicator.

3. Printing all red or black 9's without a signal.

   A. Check Adj. 21.
   B. Replace the clutch.
   C. Install total key, add key, sub-total key and clutch release fork shaft.

4. Printing all black 9's on a total or sub-total with a signal.

   A. Check Adj. 1, Figs. 1, 2 & 3 for sluggish add pendant.
   B. Check for weak spring on total control bellcranks.
   C. Check for loose cams group.
   D. Check for binding transfer lock bail.
   E. Check for latch not releasing from bellcrank, Adj. 37.
   F. Check Adjs. 5 & 21, Fig. 1.
   G. Check Adjs. 20 & 33 for clearance being too wide.
   H. Check for ribbon control latch 1 catching lip of the pendant during a subtract cycle. See Adj. 39 & Parts Manual.

TEST PROBLEMS

When a Friden Adding Machine is received from the Factory, it should be tested by a qualified member of the Service Department. Discrepancies that are found are to be recorded and returned to the General Service Department at San Leandro.

Check the following Items, by duplicating the test tape shown on page 4 through 12 of this test. Use this test when testing a machine which has been repaired.

COVERS
Check the condition of the paint, the fit of the covers and check for dents or damage.

ELECTRICAL & CLUTCH MECHANISM
Test the closing of the Micro Switch before the releasing of the Clutch. Test the action of the Clutch mechanism; the holding down of the operating Keys; the proper restoring of the Clutch slide and the stopping of the machine.

KEYBOARD & SELECTION
Check for the proper action of the Selection Keys; the Pins setting; the Sector releasing; the time of Carriage escapement.

CARRIAGE
Check for the proper Sector movement when it is released. Check the proper movement of the Carriage when it escapes. Check for the proper Carriage restoring. Check the relatching of the Sectors; the alignment of the Sectors.

REPEAT ADD CYCLE
Check for the proper depression and the restoring of the Key. Check the proper returning of the Sectors to their selected position. Check that the Carriage does not restore. Check that Carriage escapes when optional escapement switch is in shift position.

ACCUMULATOR - TRANSFER - FUGITIVE ONE
Check that the proper transfer action occurs and that the Transfer Wave and the Fugitive One operates properly.

CLEAR KEYBOARD CYCLE
Check for the proper depression and the restoring of the Key. Check that no printing occurs and that the Carriage is restored.

ADD CYCLE
Check for the proper depression and the restoring of the Key. Check for proper printing, black print, restoring of carriage. Check that the proper amount is entered in the Accumulator.

MINUS CYCLE

Check for the proper depression and the restoring of the Key. Check for the Red print and the Minus Symbol. Check that the amount stored in the Accumulator

PRINT ONLY CYCLE

Check for the proper depression and the restoring of the Key. Check for the proper Symbol. Check that the amount Selected and printed is not entered into the Accumulator.

SUB-TOTAL CYCLE

Check for the proper depression and the restoring of the Key. Check for the proper Symbol. Check that the Accumulator is not cleared.

TOTAL CYCLE

Check for the proper depression and the restoring of the Key. Check for the proper Symbol. Check that the Accumulator is cleared.

PRINTING

Check the proper action of printing; the clarity of the figures, decimal, commas, and Symbols.

SYMBOLS

Check that the proper Symbol is printed on the operations that require a Symbol. Check the printing of the Clear Symbol on the first print operation after a Total.

PENDANTS

Record any improper action of the Add Pendant or the Subtract Pendant.

TAPE FEED

Check the proper single space feed. Check the proper double space feed on the manual lever and on the Sub-total and Total cycles. Check the Detent Wheel action.

RIBBON COLOR CONTROL

Record any improper action that may result in a partial black and red print or an improper color print.

RIBBON FEED & REVERSE

Check the ribbon feed and its reverse action. Check Ribbon tension.

ACTUATORS

Record any improper action of the Actuators, which may be found to have caused difficulty.

INTERLOCKS

Check the proper action of the interlocks.

BINDING PARTS

Check machine carefully for possibility of binding parts. Be specific when reporting such conditions, giving the proper numbers and locations of the parts in the machine.

SCREWS & PINS

Check the machine carefully for loose screws, taper pins, nuts, clips, shavings, or other evidence of careless workmanship. Be specific when reporting such conditions, giving the proper number and locations of the parts in the machine.

LUBRICATION

Check and note that all parts requiring lubrication are properly lubricated. Record any discrepancy caused by improper lubrication.

BACKSPACE CYCLE

Check for proper depression and restoring of the Key. Check that Carriage only back spaces one space at a time. Check that Carriage does not restore. Check that last Sector to the right restores.

REPEAT SUBTRACT CYCLE

Check for proper depression and restoring of the Key. Check for the proper returning of the Sectors to their selected position. Check that Carriage does not restore. Check that Carriage escapes to the left when Optional Escapement Switch is in Shift Position. Check for proper Symbol.

SINGLE CYCLE CLUTCH

Check for the Drive Shaft Cycling only once when operating keys other than Repeat Add or Repeat Subtract are held depressed. Check that the Drive Shaft continues to cycle when either the Repeat Add or Repeat Subtract keys are held depressed.

```
  3.57 C         .01            100.00
  1.59           .01            100.00
  2.58           .01            100.00
  1.47           .01            100.00
  3.69           .03 S          100.00
 12.90 S                        300.00 S
                 .03 T
  3.57-                         300.00 T
  1.59-          .50-C
  2.58-          .10          5,000.00-C
  1.47-          .10          1,000.00
  3.68-          .10          1,000.00
   .01 S         .10          1,000.00
                 .10          1,000.00
   .01 T         .10          1,000.00
                 .10          1,000.00
   .03 C         .10          1,000.00
   .00           .30 S        1,000.00
   .03 S                      3,000.00 S
                 .30 T
   .03 T                      3,000.00 T
                5.00-C
   .03-C        1.00         50,000.00-C
   .00-         1.00         10,000.00
   .03-S        1.00         10,000.00
                1.00         10,000.00
   .03-T        1.00         10,000.00
   .03 C        1.00         10,000.00
   .00          1.00         10,000.00
   .03 S        1.00         10,000.00
                3.00 S       10,000.00
   .03 T                     30,000.00 S
                3.00 T
   .03-C                     30,000.00 T
   .00-        50.00-C
   .03-S       10.00        500,000.00-C
               10.00        100,000.00
   .03-T       10.00        100,000.00
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TEST PROBLEMS

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111,111.10 T

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LUBRICATION PROCEDURE

LUBRICANTS TO BE APPLIED TO ADDING MACHINES

(Including Electric Input & Output Models)

1. Texaco Aircraft Instrument Oil (T-18404 or SS-125) to be used on all pivot points, bearings and guiding parts except as noted in the following illustrations and where lubricants 2, 3 and 4 are used.

2. Almasol Grease #450M (T18586) used on all cam follower rollers, cam surfaces, key stems, gear teeth and points shown in the following illustrations.

3. Shell Oil (SAE 40) used on felt washers and on the 1, 4 and 7 key stems.

4. Mobil Oil (T-18194) used on selection unit carriage shafts and sector pivots.

METHOD FOR PROPER APPLICATION

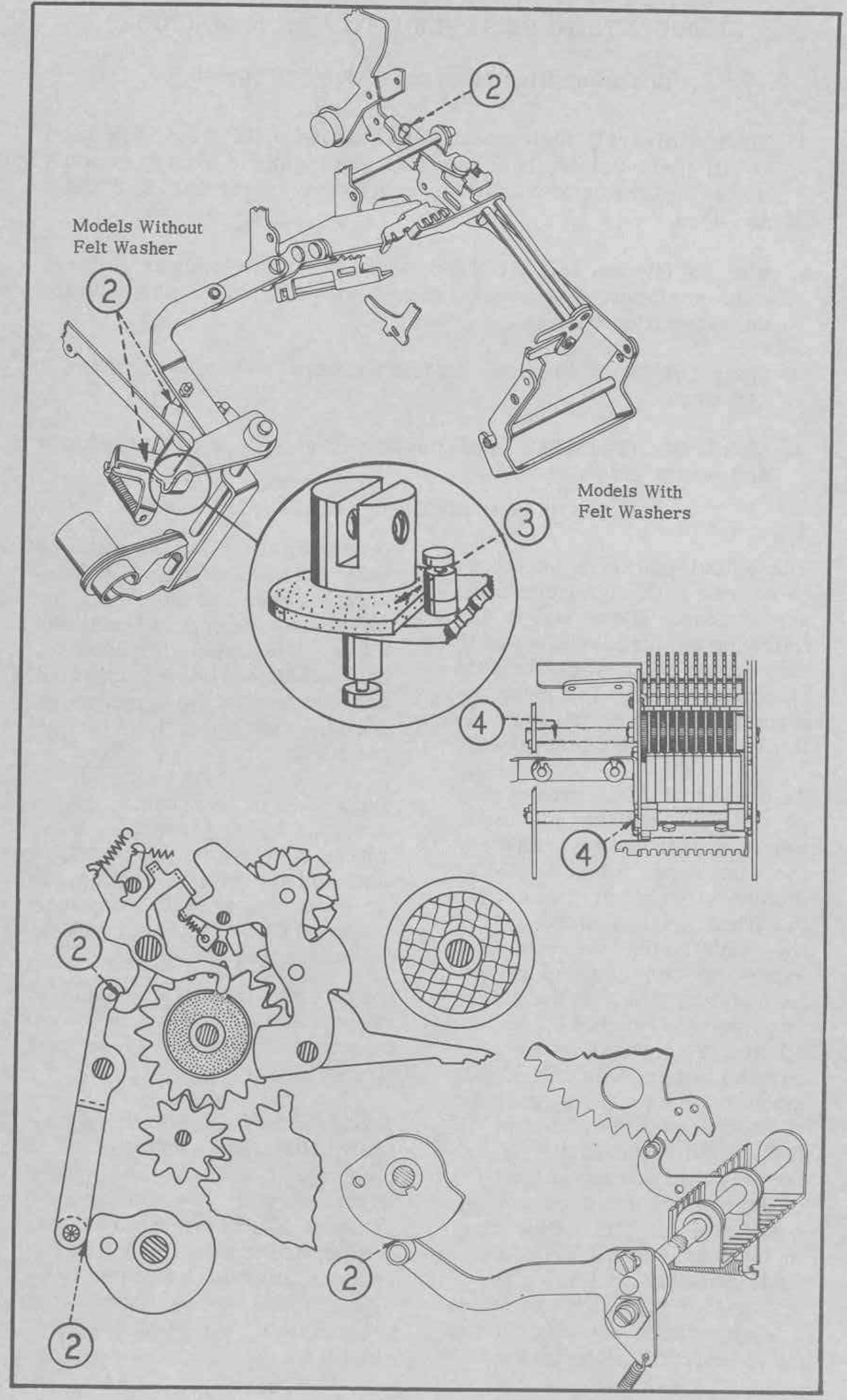
The actual points to be lubricated (and with which lubricant) are outlined above and in the following sketches numbered to correspond with the lubricant shown above. The following information outlines the lubrication procedure in a general way.

An excess of oil or grease may be defined as that amount of lubricant that does not adhere to the operating surface, sliding member, or pivot. The excess lubricant gets pushed out of the way during the operation except in the case of pivots. Lubricating with oil, the saturation point is reached the instant oil starts to overflow or runs out the other side. Even this amount is excessive in a lot of instances. The film of oil that actually lubricates is extremely thin and any oil outside of the contact area does nothing, generally, for the lubrication. In fact, excess oil can collect dust, possibly containing abrasive particles, which can cause a more rapid wearing of the parts involved. Although the difference in the wear rate may be very small, the overall difference between two machines, one lubricated properly and the other lubricated improperly, can sometimes be very apparent with respect to the appearance, sound, and operation of the machines.

With respect to lubrication with grease, light grease is used where necessary, as on cams and cam followers. Here again, an excess of grease can gather dust and dirt and affect machine operation and useful life.

Excess grease and oil should be wiped away, leaving all non-operating surfaces clean and free of lubricants.

Good lubrication entails making sure that the surfaces to be lubricated are covered with a film of oil, or the proper amount of grease, where used, is applied correctly and in the proper amount. As stated previously, all excess lubrication should be wiped off of the parts involved.


②
Models Without Felt Washer
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Models With Felt Washers
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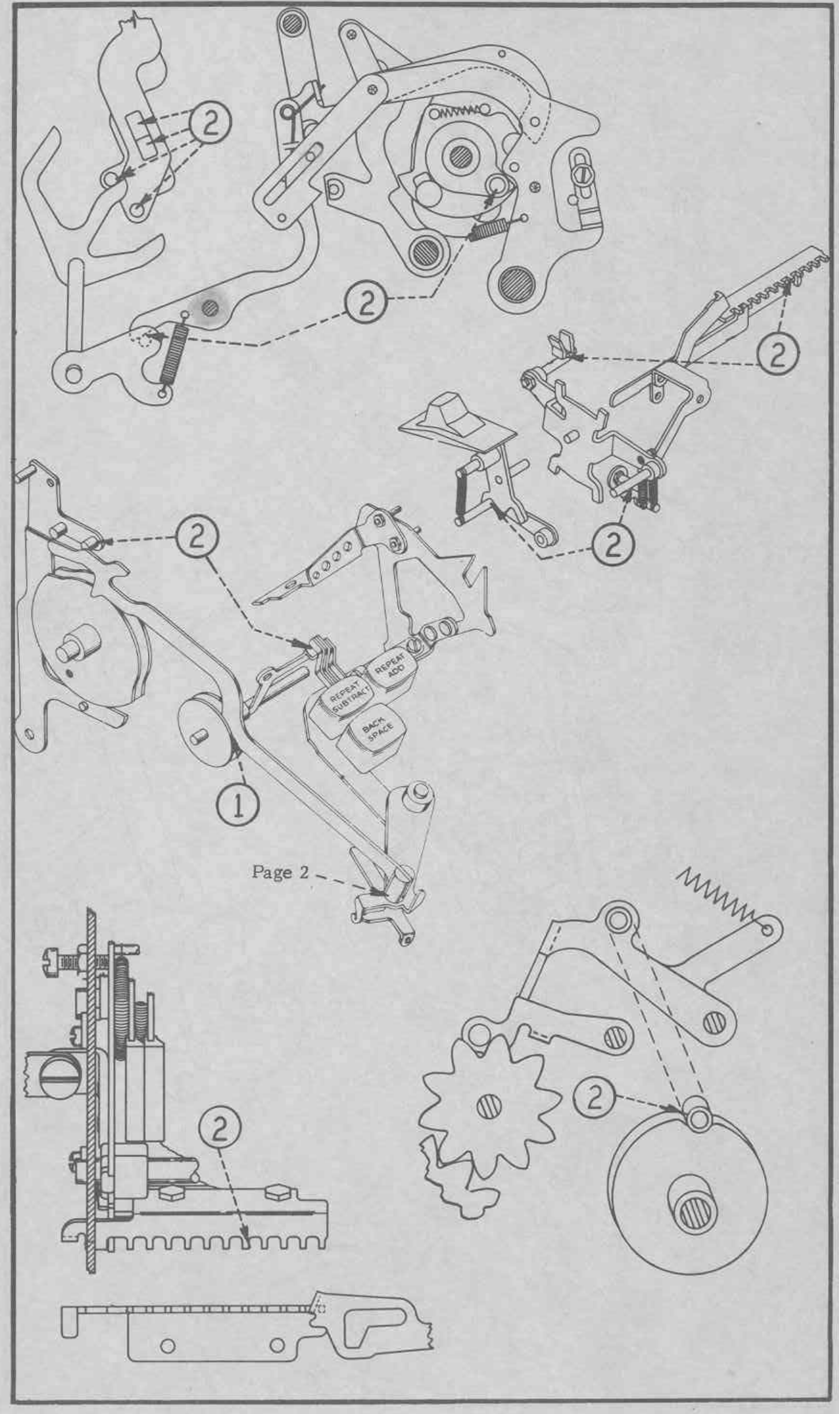
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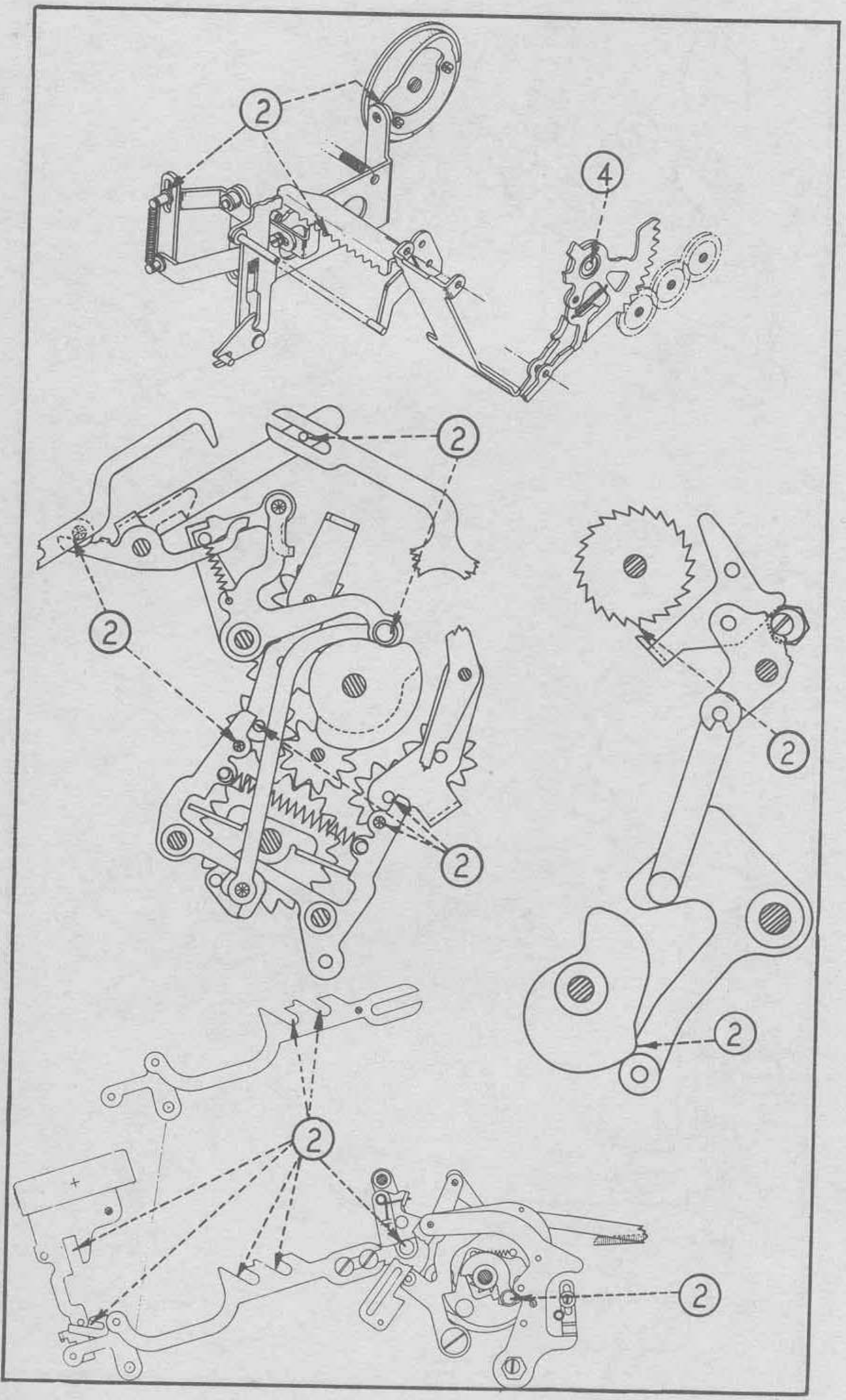
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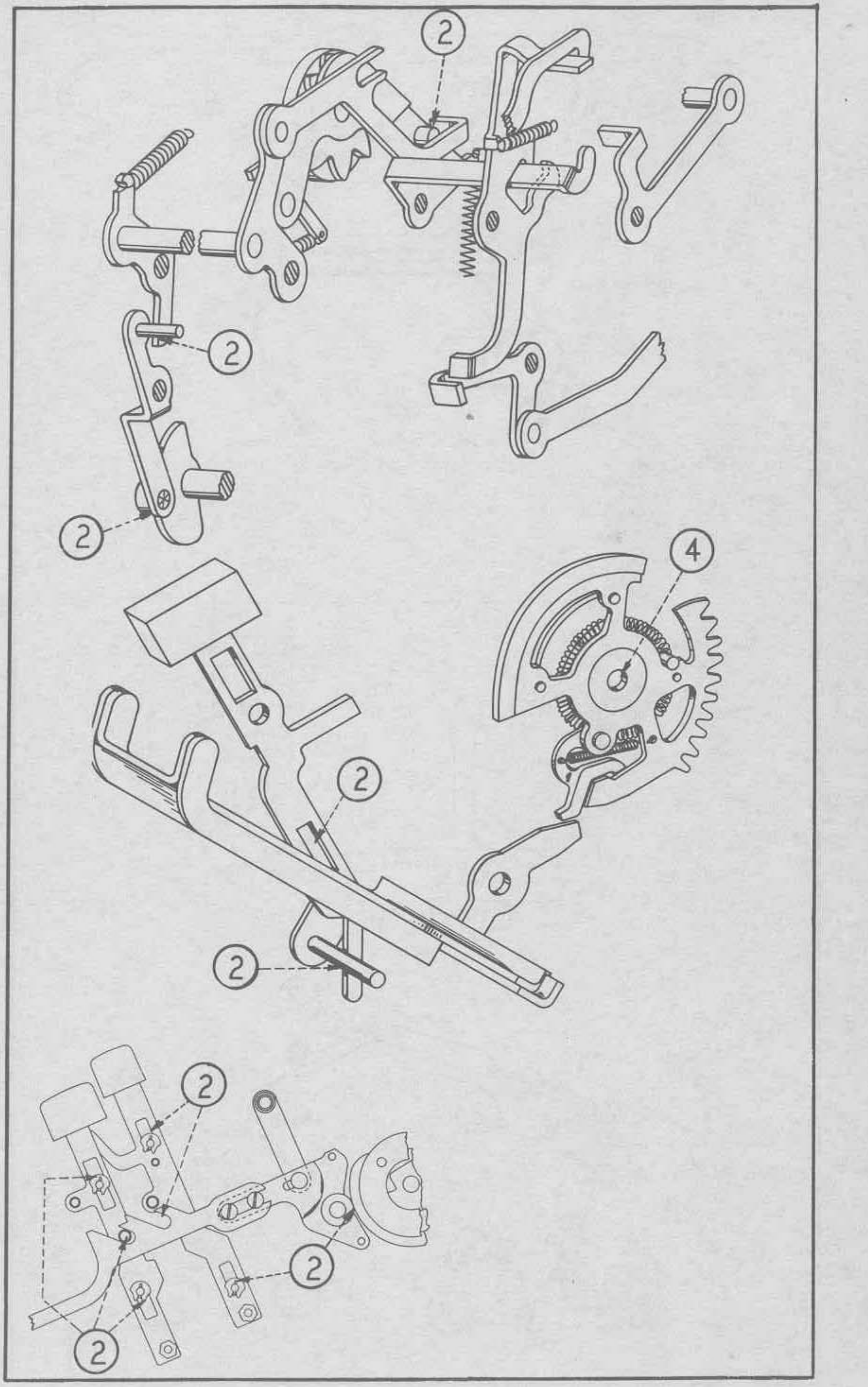

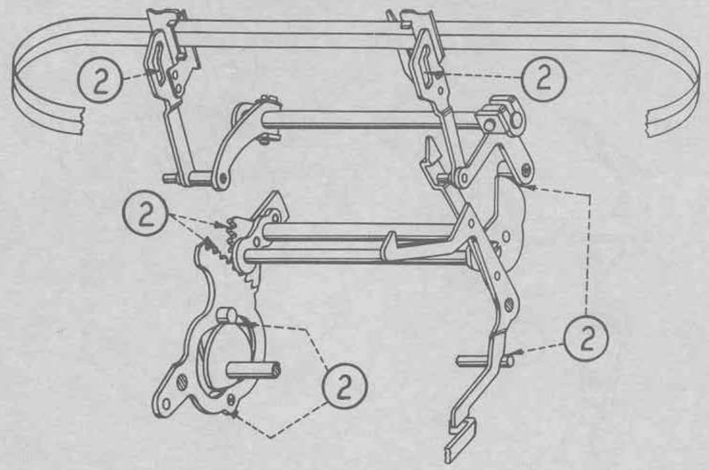
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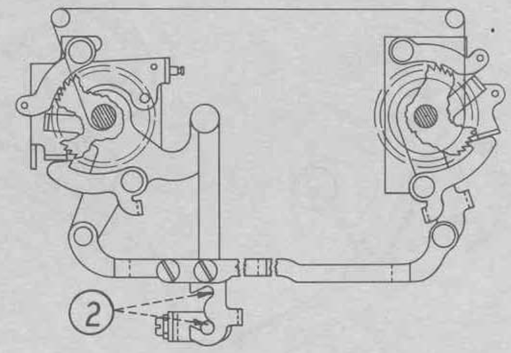
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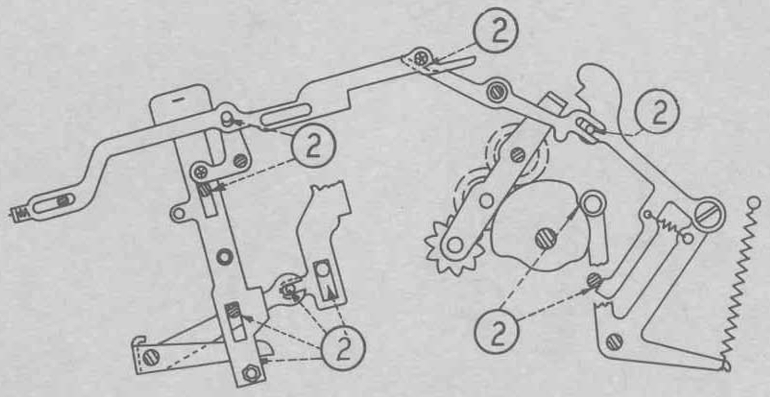
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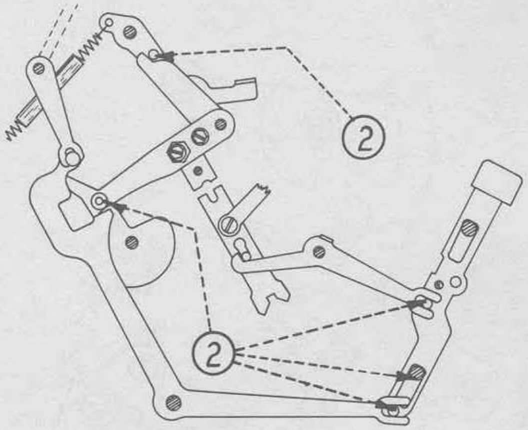
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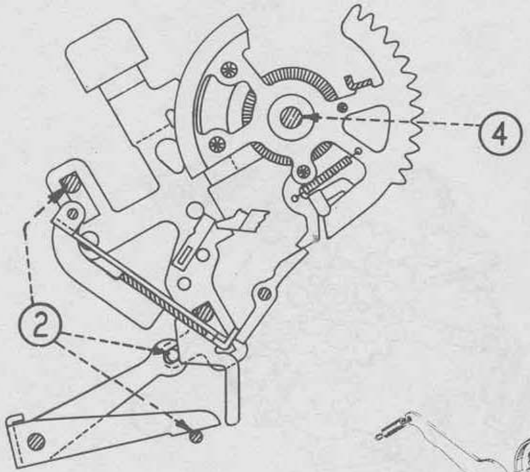
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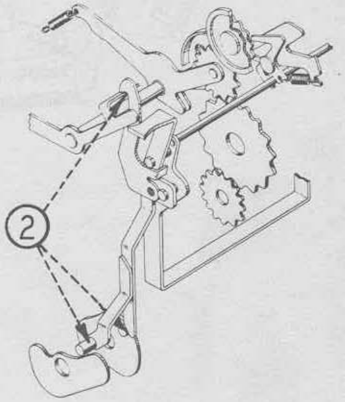
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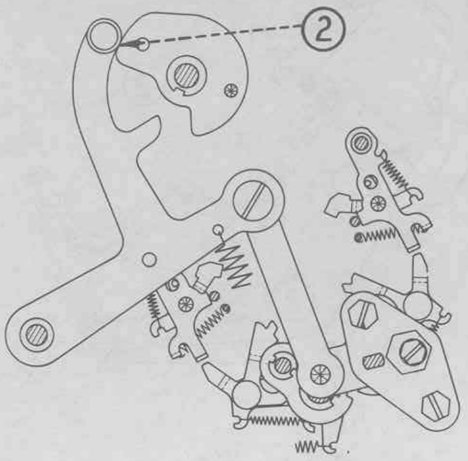
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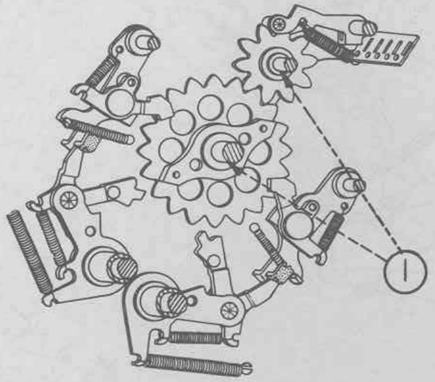
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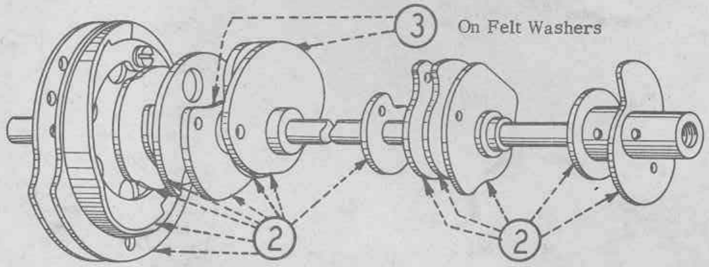
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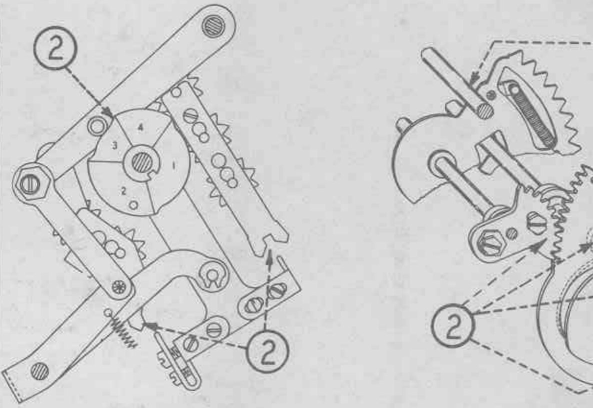
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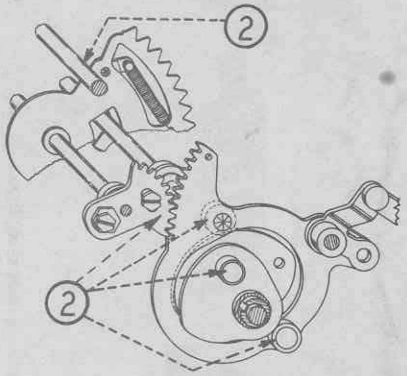
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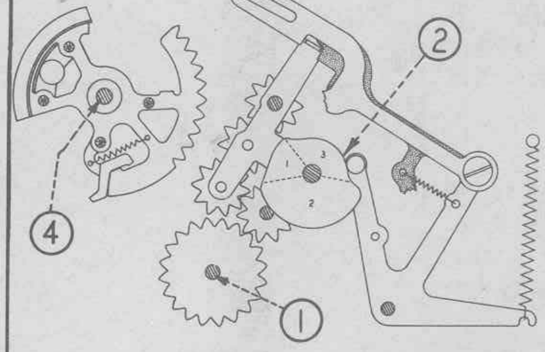
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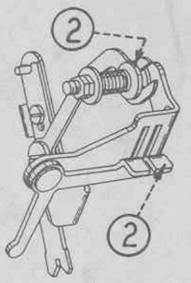
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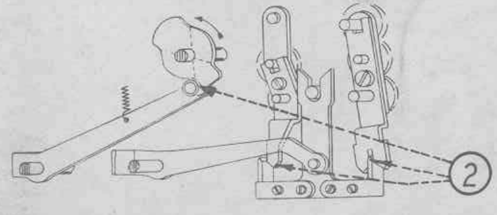
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